DECEMBER 13, 1954

Electrical World

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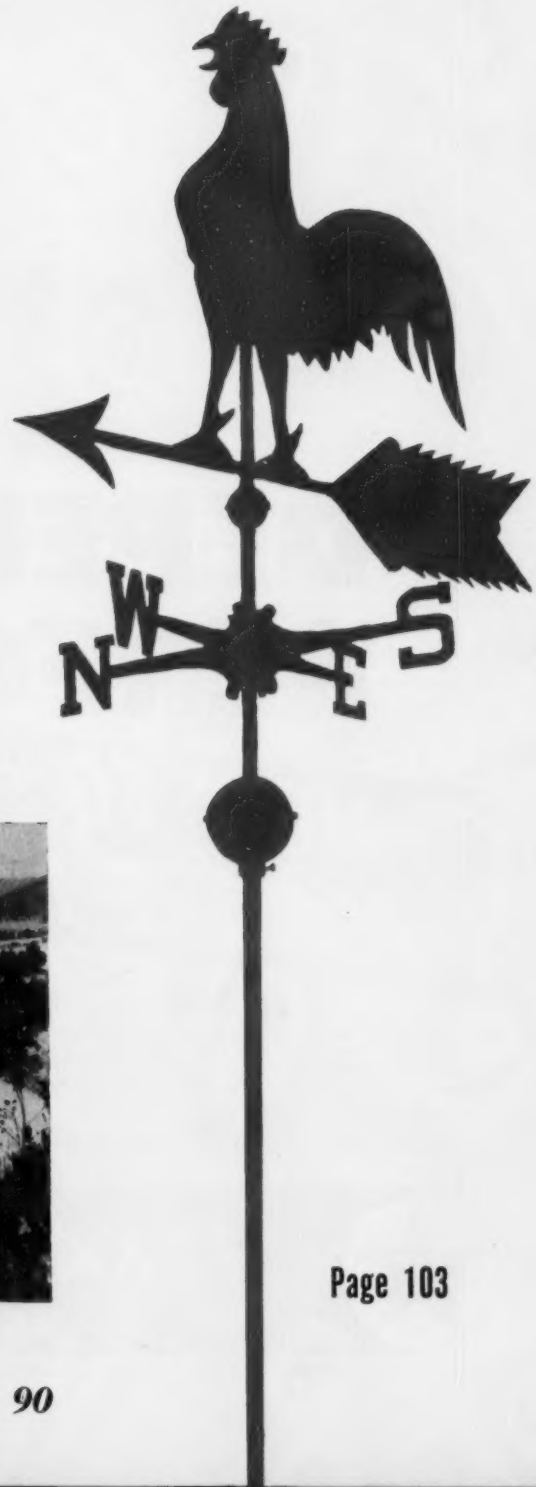
Wake Up to the Market Down on the Farm



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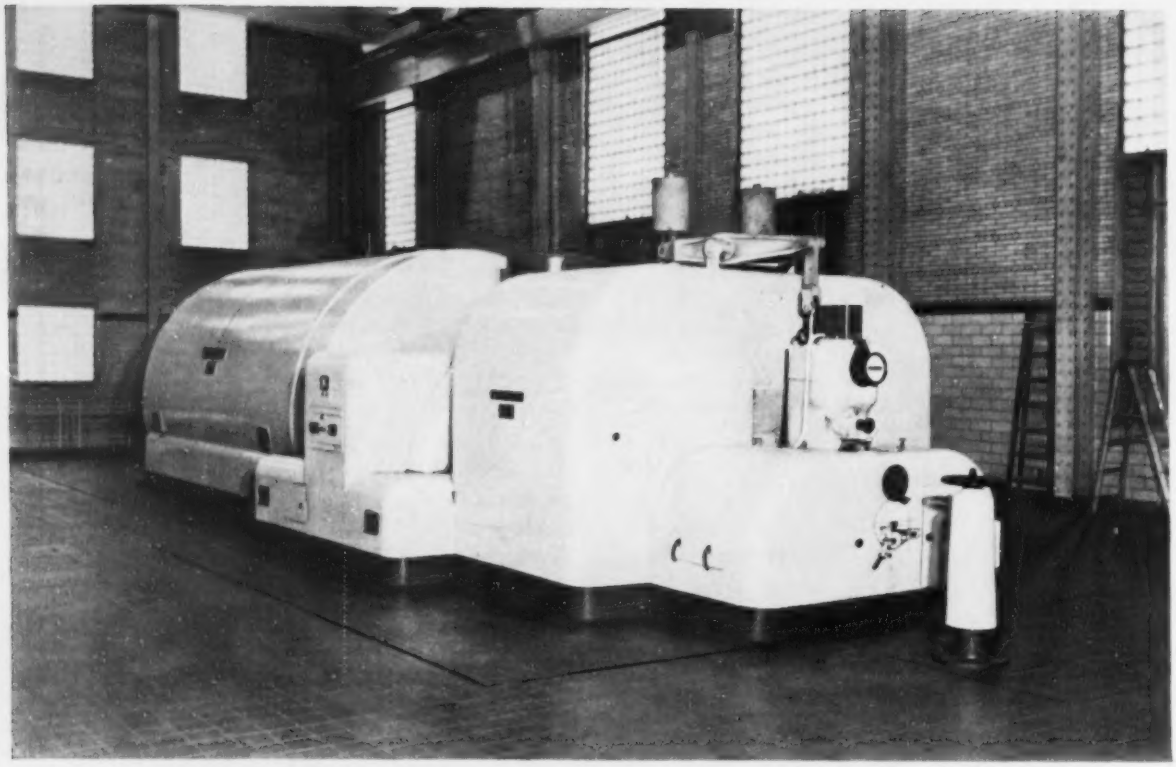

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Electrical World

Vol. 142 No 24 December 13, 1954

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ELECTRICAL WORLD

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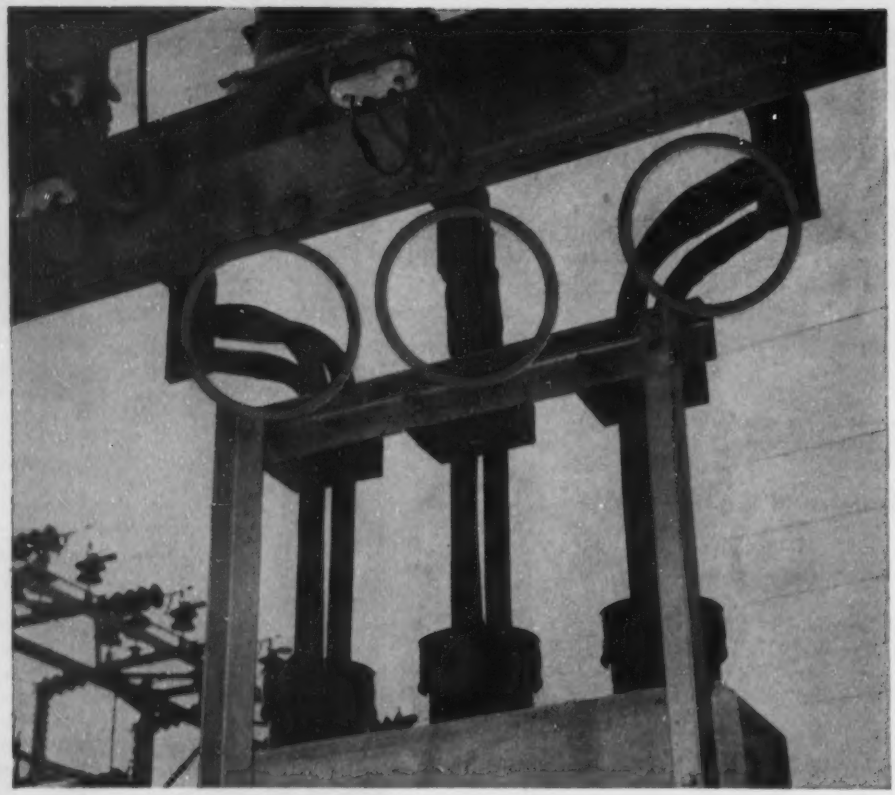

Simplicity of terminating Okolite-Okoprene unshielded 5kv cable is evident in this photograph of the Pearl River Substation feeder circuits of the Rockland Light and Power Company.

Why Okolite-Okoprene
UNSHIELDED 5KV CABLE
simplifies installation procedure

Ease of termination is an important factor in the increasing choice of unshielded Okolite-Okoprene cable for 5kv distribution circuits. Rockland Light and Power Company specified 500 MCM Okolite-Okoprene unshielded 5kv cable for the 4160-volt feeder circuits in its Pearl River Substation. Terminal stress cones and ground straps are eliminated by the unshielded construction—only a simple, easy-to-apply wrapping of Okoprene tape is needed.

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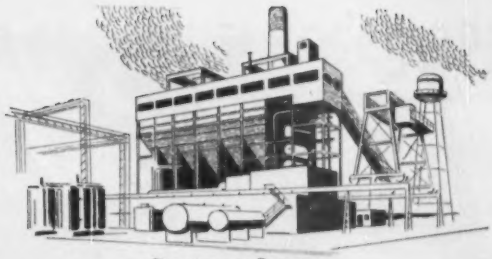
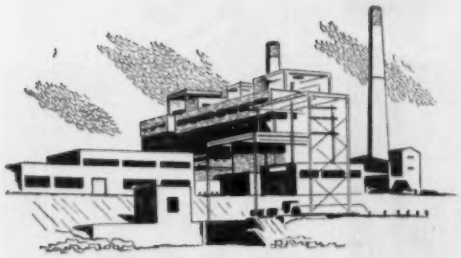


GOLDSBORO STATION
Total capability 169,000 kw.



LUMBERTON STATION
Total capability 185,000 kw.

WILMINGTON STATION
Total capability 230,000 kw. (est.)

Grinnell piping products have played a vital role in the construction of

7 NEW UNITS IN 7 YEARS

for Carolina Power & Light Company

HERE IS THE RECORD!
(Completion dates)
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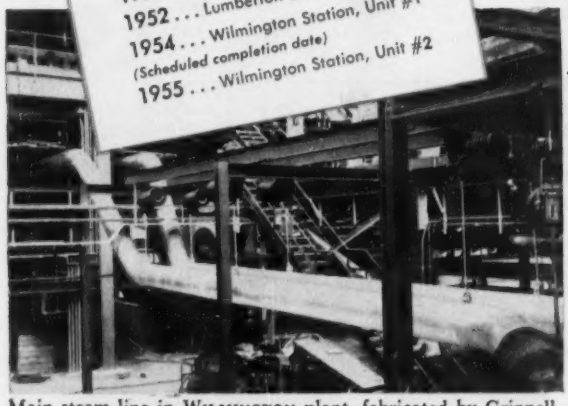
1950 . . . Lumberton Station, Unit #2
1951 . . . Goldsboro Station, Unit #2
1952 . . . Goldsboro Station, Unit #1
1952 . . . Lumberton Station, Unit #3
1954 . . . Wilmington Station, Unit #1
(Scheduled completion date)
1955 . . . Wilmington Station, Unit #2



Main steam line in WILMINGTON plant, fabricated by Grinnell, and supported by Grinnell Model R Constant-Support Hangers.

Since 1949, Carolina Power & Light's modernization and improvement program has been in full swing. Over this 6-year period, 6 new steam-electric generating units have been added to the system, with another scheduled for completion early in 1955. And very significantly, in each of these seven new units, Grinnell Prefabricated Piping and Grinnell Engineered Hangers have been employed, *exclusively!*

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Piping fabricated in Grinnell shops is done under ideal conditions, with modern equipment, by personnel qualified for each class of work. Included in the price (which is determined in advance) are such items of expense as: interpretive engineering, shop sketches and planning, procurement of materials, power services, expendable tools and supplies. There are no charges for waste material or spoilage. All piping is rigidly inspected and tested to comply exactly with customer specifications and applicable codes. Consult Grinnell on your next piping job.

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Sold Through Your Insulator Manufacturer Only

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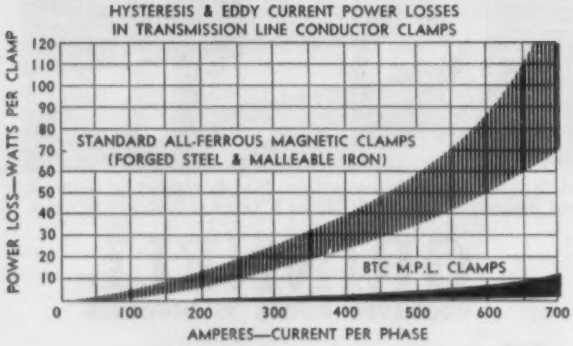

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The BREWER-TITCHENER CORPORATION

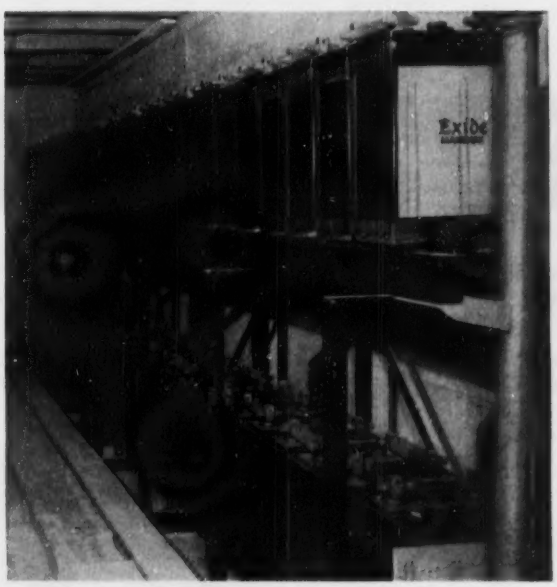
Cortland, New York

Specify BTC Clamps the next time you order from your insulator manufacturer. Their high strength is just one of the many reasons it pays to use these suspension clamps on your transmission lines.

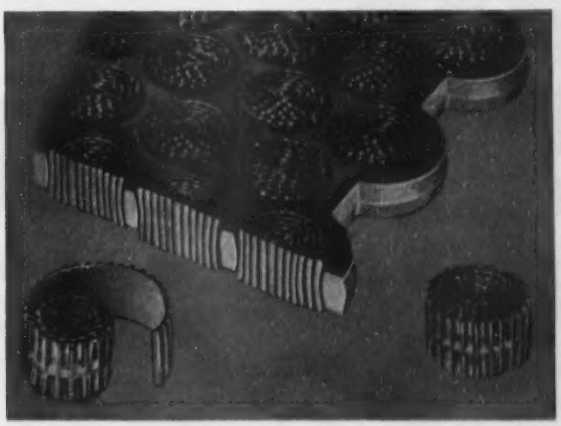
ASSURE AMPLE POWER FOR SWITCHGEAR OPERATION

. . . with dependable Exide-Manchex batteries!

THE ATOMIC ENERGY COMMISSION'S Paducah Area Project demands a tremendous supply of power, about half of which is furnished by the Joppa, Ill., Steam Electric Station of Electric Energy, Inc. Dependability of all equipment is the prime requisite. It is significant that the four boiler and turbine units at this vital station, generating 650,000 kw, rely on Exide-Manchex batteries for *positive operation* of switchgear at ample voltage. Instant power for all other control circuits and for emergency lighting is assured. In addition, lower costs for operation, maintenance and depreciation make Exide-Manchex *your best battery buy* for all control and substation services!



HERE ARE HALF of the two 120 cell FME-15 Exide-Manchex batteries installed at the Joppa Station. Assure dependable power, easy maintenance (water is needed only about twice a year) by buying Exide-Manchex batteries. For full details, call your Exide sales engineer—write for form 5001 (Engineering and Maintenance Manual).



THE POSITIVE PLATES are the heart of any battery. Only Exide-Manchex have the famous manchester positive plates with buttons of active material. These buttons, inserted in a strong alloy grid, assure you of *high capacity* in a compact space, with an unusually long battery service life.

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. . . for all control and substation services

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MANCHEX® BATTERIES

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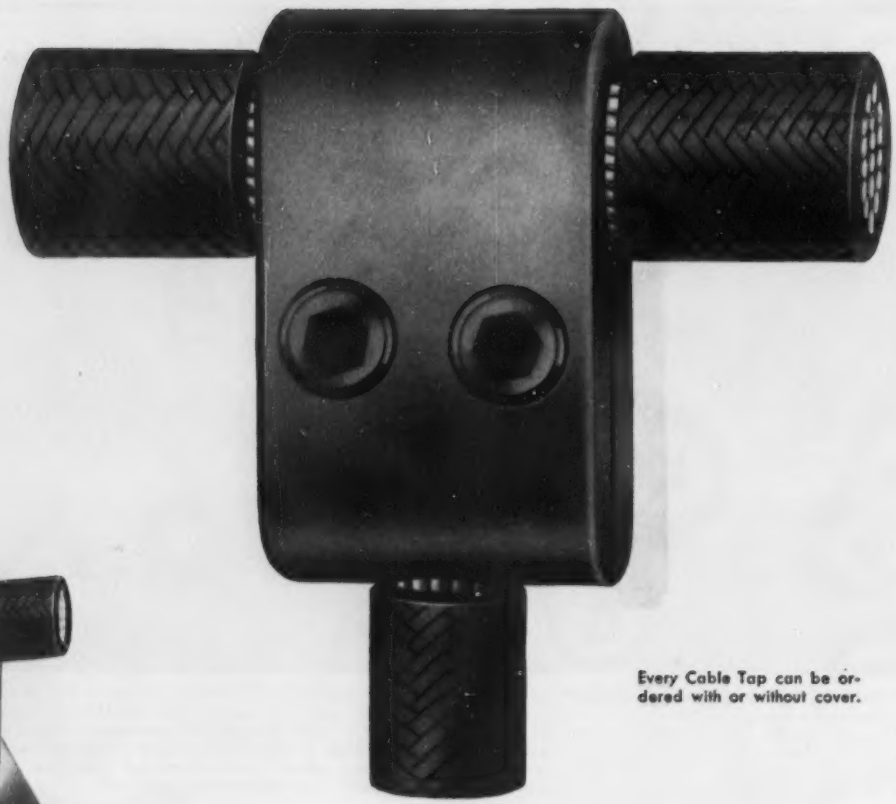
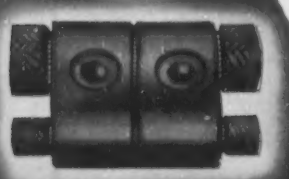
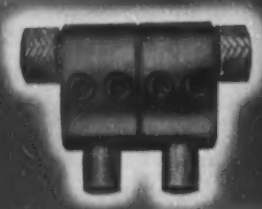
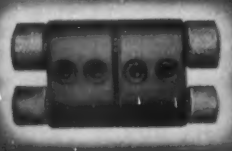
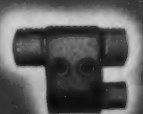


Every Cable Tap can be ordered with or without cover.









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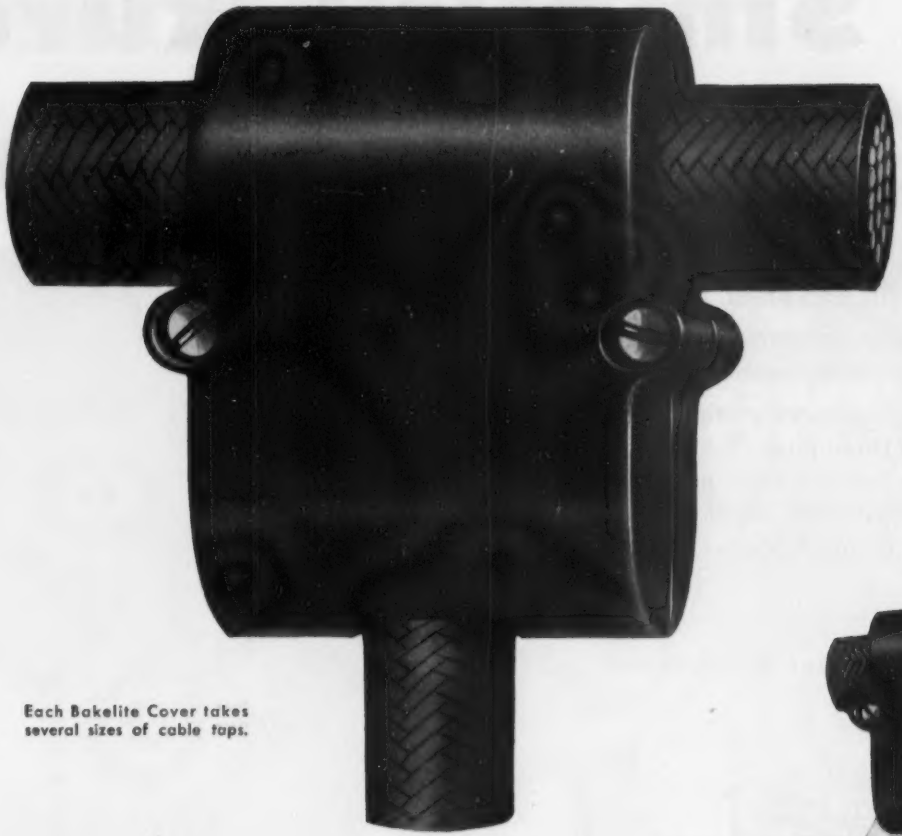
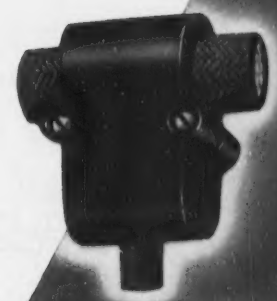
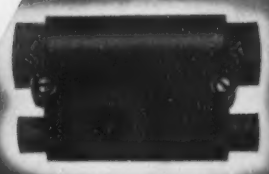
Originated and fully developed by Penn-Union, the "TYPE PC" CABLE TAPS are widely preferred for a neat, compact connection — that holds tight permanently.

The bodies are high copper content alloy. Large socket-head tap screws. Carried in stock in a complete range of sizes up to 1,000 MCM mains.



Each Bakelite Cover takes several sizes of cable taps.





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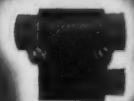

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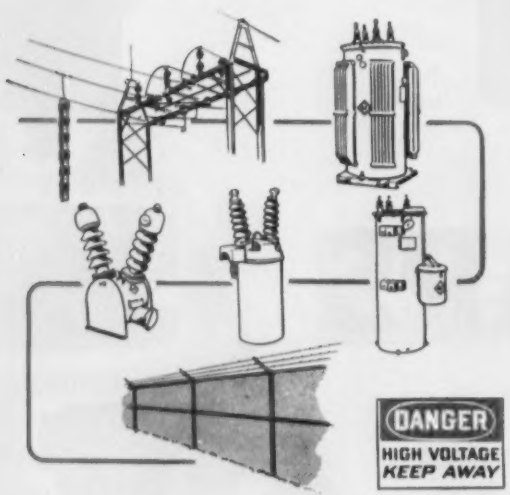

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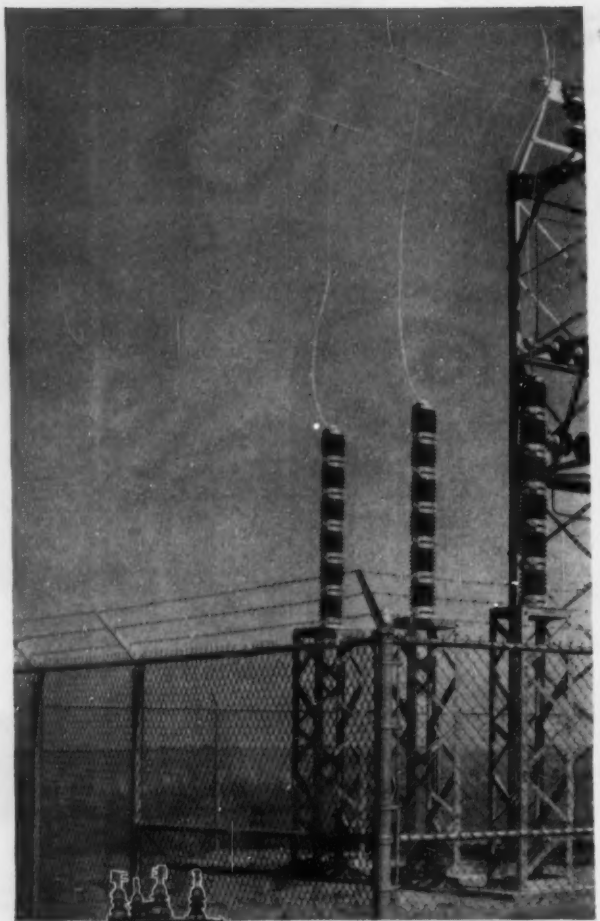
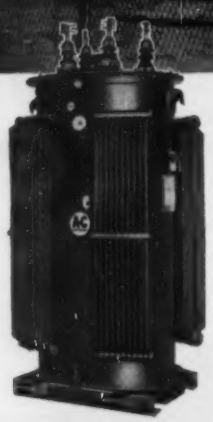
A-4520





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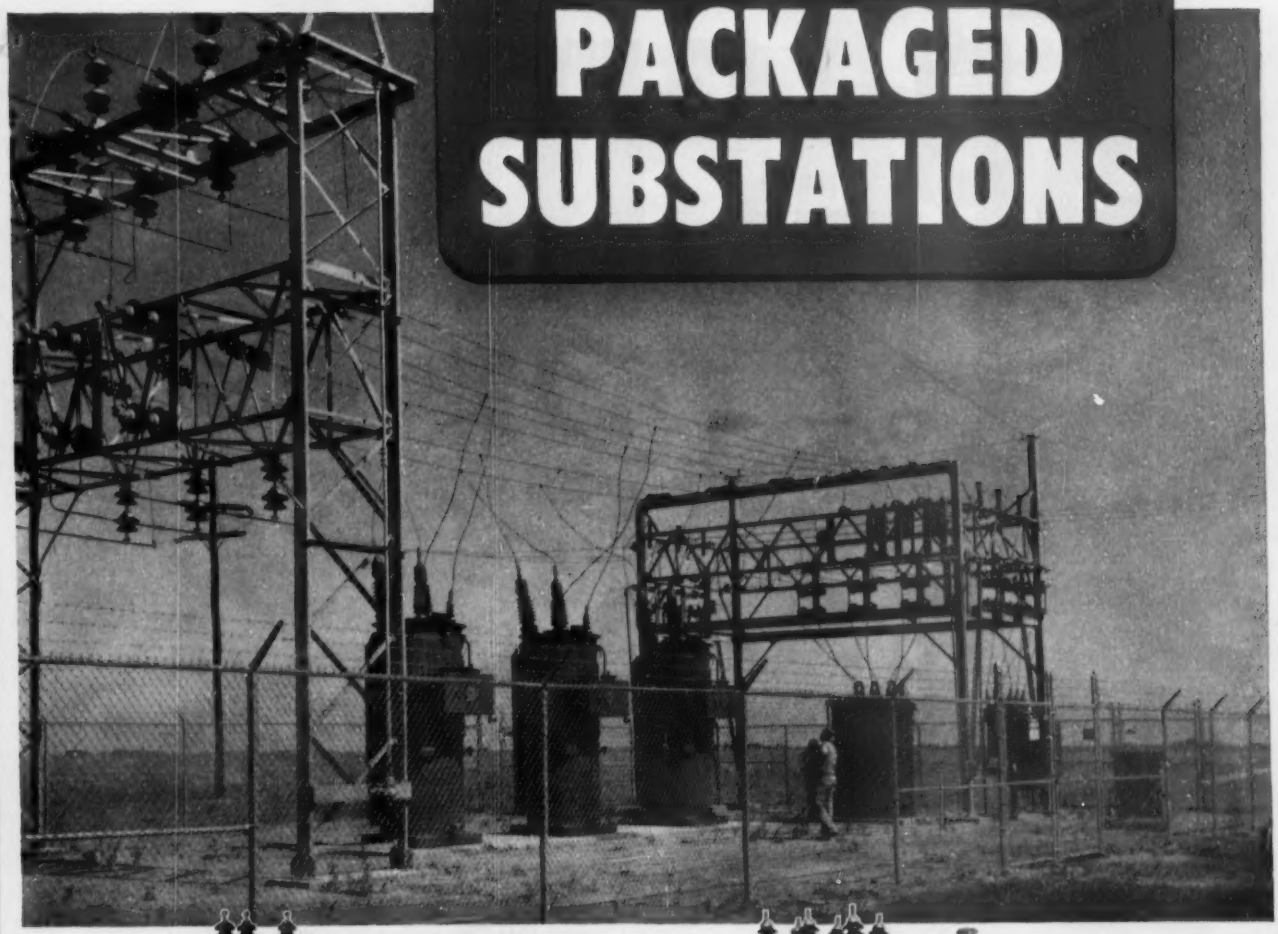

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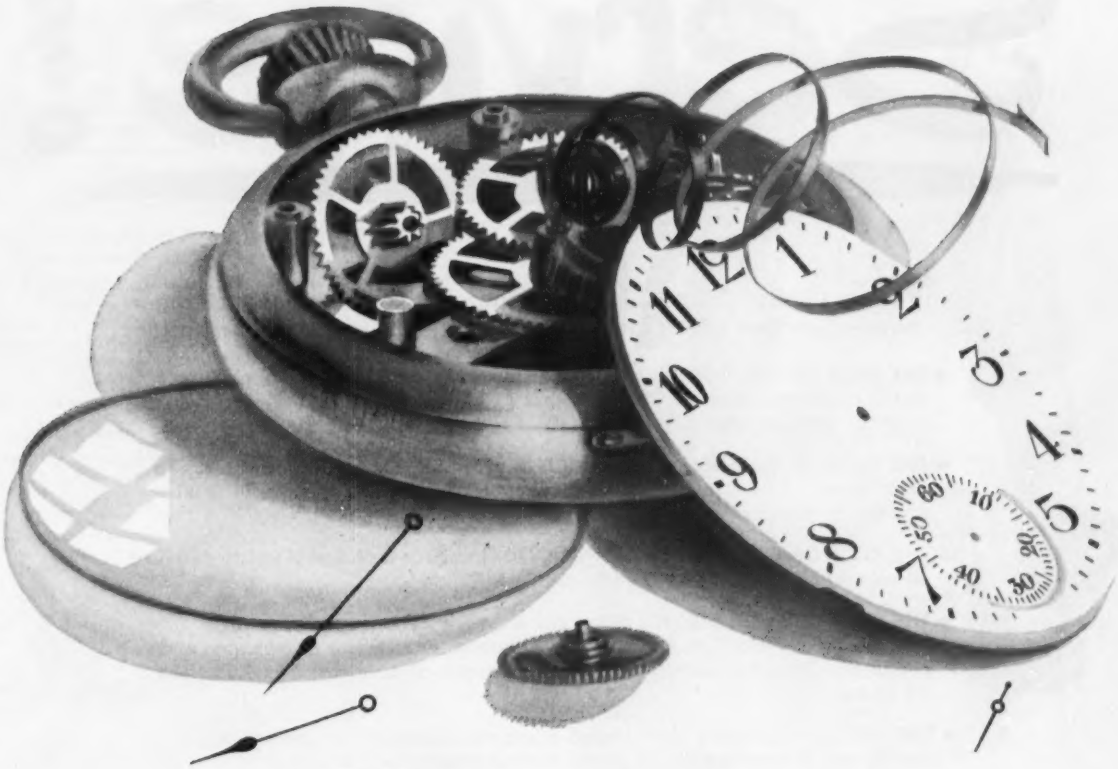
Everything a watch should have

—except the tick!



Your plant can't "tick" properly, either—without Correct Lubrication!

Like this watch, your plant may have all the right "parts"... the finest machines made... yet may not be "ticking"—running at top efficiency—because something is lacking. That "something" is called *Correct Lubrication!*

By Correct Lubrication we mean much more than just "oil" and "grease"—which any oil supplier can provide. We mean a detailed *program* of lubrication—designed specifically for your kind of machinery and type of operation.

Working with your personnel, we analyze all your machines and their operating conditions to determine their exact lubrication requirements. Then we recommend the *right* Gargoyle product for every moving part, advise on correct methods of application, set up proper lubrication schedules, follow up regularly with progress reports on benefits achieved.

In plant after plant, such a program has effectively boosted production—materially cut maintenance costs. It can do the same for you. Why accept less?

Socony-Vacuum

SOCONY-VACUUM

Correct Lubrication

FIRST STEP IN CUTTING COSTS

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

A CHALLENGE TO YOU ON

Service!

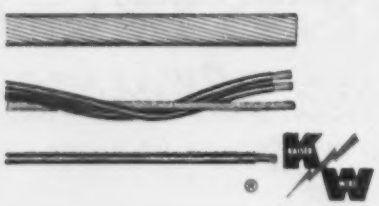
WE'RE talking about Kaiser Aluminum's kind of service—*customer-minded service* that's unsurpassed in the industry! For example:

- **THE KIND OF MILL COOPERATION** that put 40,000 pounds of a non-stock item in the hands of a Kansas City customer in less than 48 hours—thus preventing a costly work stoppage.
- **THE KIND OF ENGINEERING SERVICE** that moved a large eastern utility to say: "Kaiser Aluminum did a perfect job of training our personnel in aluminum techniques!"
- **THE KIND OF STRATEGIC WAREHOUSING** that gave an Arizona utility delivery on an urgent ACSR order *before* promised!
- **THE KIND OF SALES SERVICE** that caused an Illinois utility purchasing agent to write "Well done!" to a Kaiser Aluminum sales engineer who located and personally delivered an emergency requirement of accessories in less than 24 hours!
- **THE KIND OF QUALITY** that caused a large midwestern customer to say that Kaiser Aluminum ACSR is the highest quality available today!
- **THE KIND OF ATTITUDE** that moves our people—from the mill to the field—to work harder, longer and with greater determination. An attitude that causes customers to write "wonderful cooperation" . . . "always willing to help out" . . . "you have done the impossible for us" . . . "splendid service and quality" . . . "can't beat Kaiser Aluminum service" . . . "Kaiser Aluminum has never let us down!"

These are only a few of *hundreds* of examples of the alert service our customers get *automatically* when they specify Kaiser Aluminum conductor.

We invite you to prove to yourself—with your next ACSR order—that our service is the kind you've been looking for.

For immediate attention, contact the Kaiser Aluminum sales office listed in your telephone directory or one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc., *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Building, Oakland 12, Calif.



Kaiser Aluminum

setting the pace—in growth, quality and service

Polyethylene & Neoprene Weatherproof and Triplex • Quadruplex • ACSR • All Aluminum Conductor • Rectangular, Solid Round and Tubular Bus

Kaiser Aluminum services available to you:

Field Service—Experienced Kaiser Aluminum field engineers are available to work with your crews on stringing jobs; demonstrate ways to speed installations and cut costs.

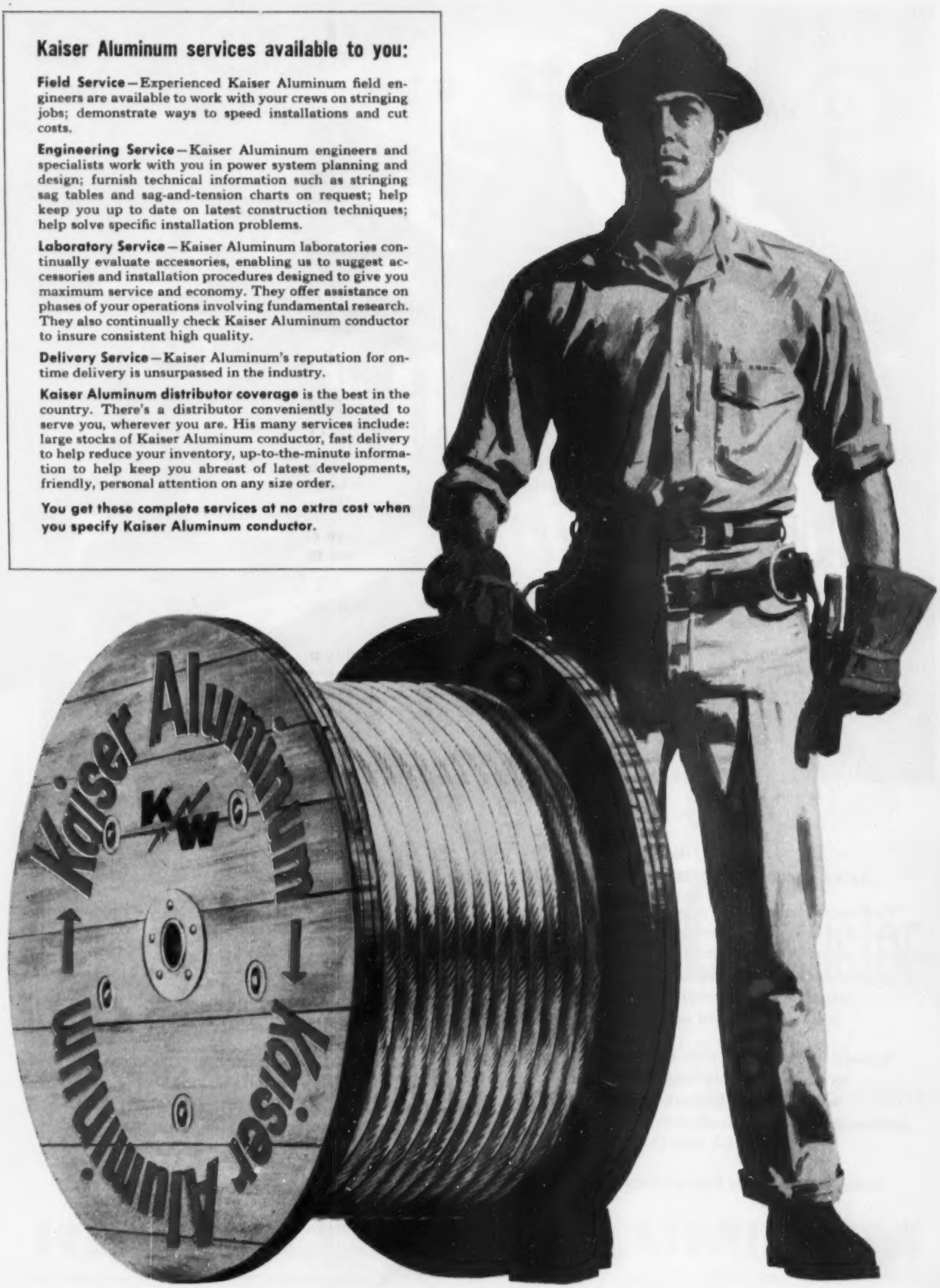
Engineering Service—Kaiser Aluminum engineers and specialists work with you in power system planning and design; furnish technical information such as stringing sag tables and sag-and-tension charts on request; help keep you up to date on latest construction techniques; help solve specific installation problems.

Laboratory Service—Kaiser Aluminum laboratories continually evaluate accessories, enabling us to suggest accessories and installation procedures designed to give you maximum service and economy. They offer assistance on phases of your operations involving fundamental research. They also continually check Kaiser Aluminum conductor to insure consistent high quality.

Delivery Service—Kaiser Aluminum's reputation for on-time delivery is unsurpassed in the industry.

Kaiser Aluminum distributor coverage is the best in the country. There's a distributor conveniently located to serve you, wherever you are. His many services include: large stocks of Kaiser Aluminum conductor, fast delivery to help reduce your inventory, up-to-the-minute information to help keep you abreast of latest developments, friendly, personal attention on any size order.

You get these complete services at no extra cost when you specify Kaiser Aluminum conductor.



HERE'S REAL *Versatility* IN OUTDOOR LIGHTING CONTROL

THE FISHER-PIERCE
SERIES 64400 PHOTOELECTRIC CONTROL

This control embodies the proven, dependable F-P basic circuit, in a simple, compact form. Mounting versatility of this unitized control is represented in the adaptions to various manufacturers' luminaires illustrated here, as well as ballast, pole top, cross arm, standard and other mountings.

Versatility of the Series 64400 Control is equalled by its economy. Low initial cost, savings in wiring, labor and materials, as well as low maintenance cost, make it economically practical to use one F-P 64400 Control per lamp.

Complete Descriptive Data on Request

THE FISHER-PIERCE CO.,
82 Pearl Street, So. Braintree, Boston 85, Mass.

EXPORT: PHILLIPS EXPORT CORP.
DIVISION OF NORTH AMERICAN PHILLIPS
100 E. 42ND STREET
NEW YORK 17, N. Y.

IN CANADA:
NORTHERN ELECTRIC
CO., Ltd.

NEW SIZES SHAPES VERSATILITY

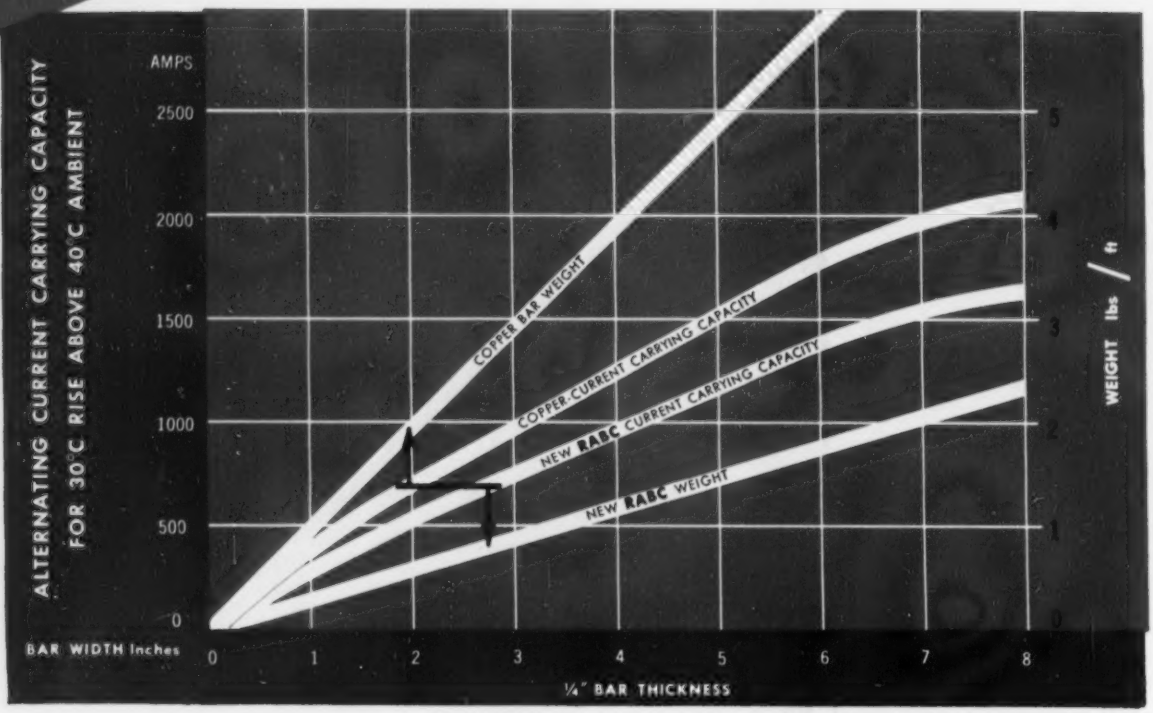
FEATURING: Optimum Strength* High Conductivity • Low Cost

Now, Reynolds gives you complete freedom in designing aluminum bus conductor installations. It is no longer necessary to specify oversize conductors because of intermediate size limitations. The new, unlimited range of sizes and shapes in which RABC (Reynolds Aluminum Bus Conductor) is available permits designing to the minimum amount of metal needed for the current carrying job. The result is material costs as low as or lower than for any previous aluminum bus conductor.

Look to Reynolds for new aluminum firsts in industry. Just as Reynolds was first to develop a high strength, high conductivity, low cost aluminum bus conductor. First to supply experimental samples to major electrical equipment manufacturers. First to offer production quantities to the industry. First to supply a production order. And, now, first with an unlimited range of sizes and shapes.

Call on Reynolds Engineering Service for help on your electrical problems. Reynolds engineers will conduct meetings with your men and provide them with the latest information on all electrical applications of aluminum. Also write for more complete information on the revolutionary RABC and a complete index of design and fabrication literature. *Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.*

NEW Reynolds Aluminum Bus Conductor



Added strength, size and shape design advantages of new RABC (Reynolds Aluminum Bus Conductor) have very little effect on electrical conductivity. An example from the chart above shows how favorably this new material compares in current carrying capacity. A current load of 700 amperes requires a copper bar 2" x ¼" weighing just under 2 pounds per foot; new RABC carries the same load with a 2.8" x ¼" bar weighing only ⅘ pounds per foot. The result is a 60% savings in weight.

Other favorable properties of RABC (compared with previous bus conductor materials in the table below) are an answer to electrical industry demands. Consider a ¼" x 4" aluminum bus with 29,000 psi tensile in relation to a ¼" x 3" copper bus with 37,500 psi tensile and equal current capacity. With short circuit strength a direct function of tensile strength, 4 times 29,000 psi for RABC indicates short circuit strength in excess of copper at 37,500 psi times 3. In addition, the smaller temperature coefficient of resistance for RABC tends to improve its current carrying capacity; and the skin-effect resistance ratio is much lower than for copper.

ALUMINUM vs. COPPER BUS CONDUCTOR MATERIALS

PROPERTIES	COPPER	ALUMINUM EC-H17	ALUMINUM RABC
Tensile Strength (psi)	33,000 to 37,500	17,000	29,000*
Yield Strength (psi)	Not Specified	15,000	25,000*
Electrical Conductivity % IACS	98%	61%	55%*
Current Carrying Capacity†	100%	82%	79%
Resistivity @ 20°C (microhms, sq in./ft)	8.31	13.36	14.82
Modulus of Elasticity (lb/in.²)	16×10^6	10×10^6	10×10^6
Density (lb/in.³)	.322	.09765	.09765
Temp. Coeff. of Resistance (% per °C @ 20°C)	.393	.403	.360

*Guaranteed minimum. †For given temperature rise and same cross section.

A comparison of cost for ¼" x 4" aluminum and ¼" x 3" copper bus conductors shows the savings that can be effected with new RABC.

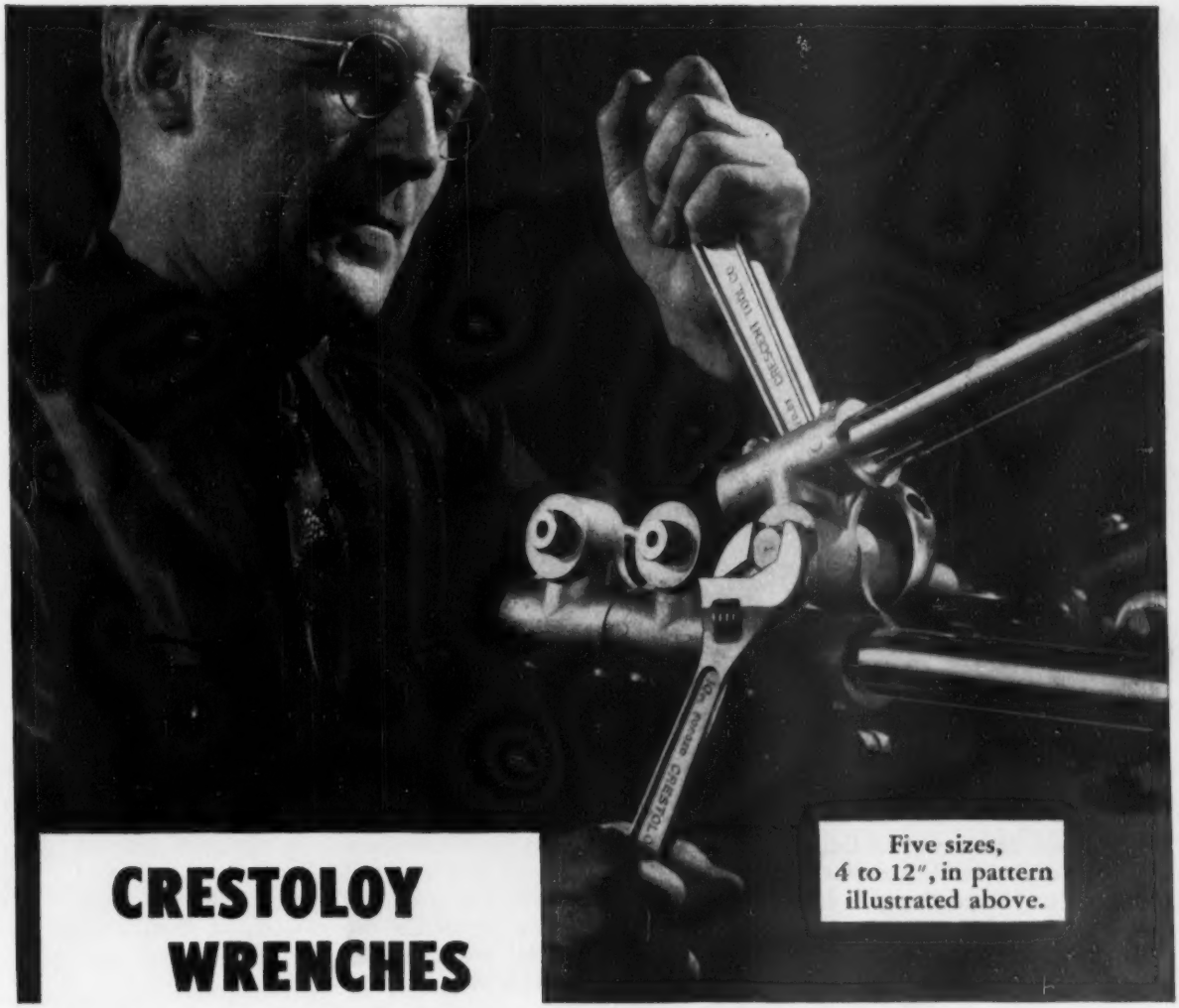
	COPPER	ALUMINUM EC-H17	ALUMINUM RABC
Weight per ft	2.9 lbs	1.17 lbs	1.17 lbs
Price per lb	$ .45	$.607	$.426
Price per ft	$1.30	$.71	$.50

For more complete information write to *Reynolds Metals Company, 2584 S. Third Street, Louisville 1, Ky.*

"See Mister Peepers", starring Wally Cox, Sundays on NBC-TV

REYNOLDS ALUMINUM

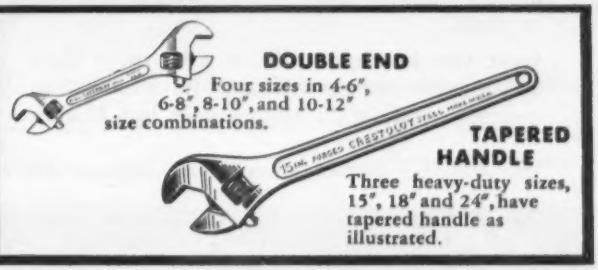
MODERN DESIGN HAS ALUMINUM IN MIND



Five sizes,
4 to 12", in pattern
illustrated above.

CRESTOLOY WRENCHES

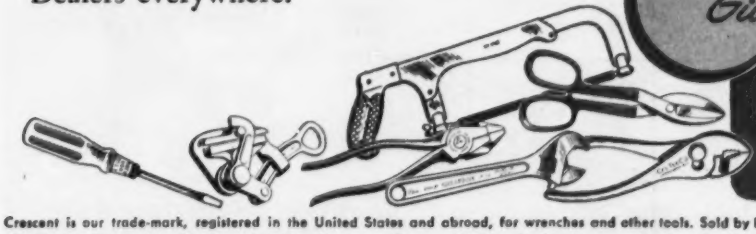
Forged from Crescent's own CRESTOLOY Steel, these fine wrenches are 200% stronger and 30% thinner than conventional adjustable wrenches. They are hardened by a selective induction process which guarantees longer life through a combination of surface hardness and interior toughness. Chrome plate finish. Sold by Industrial Distributors and Hardware Dealers everywhere.



DOUBLE END
Four sizes in 4-6", 6-8", 8-10", and 10-12" size combinations.

TAPERED HANDLE
Three heavy-duty sizes, 15", 18" and 24", have tapered handle as illustrated.

CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan
Symbol of Excellence



Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

No utility has ever "bought" a Watthour Meter

You see, to our way of thinking, a utility does not "buy" watthour meters—it invests in them. Watthour meters are the instruments through which an electric power company's revenue is determined. Don't you agree that purchasing them is really an investment . . . an outlay of capital with the view of obtaining an income or profit?

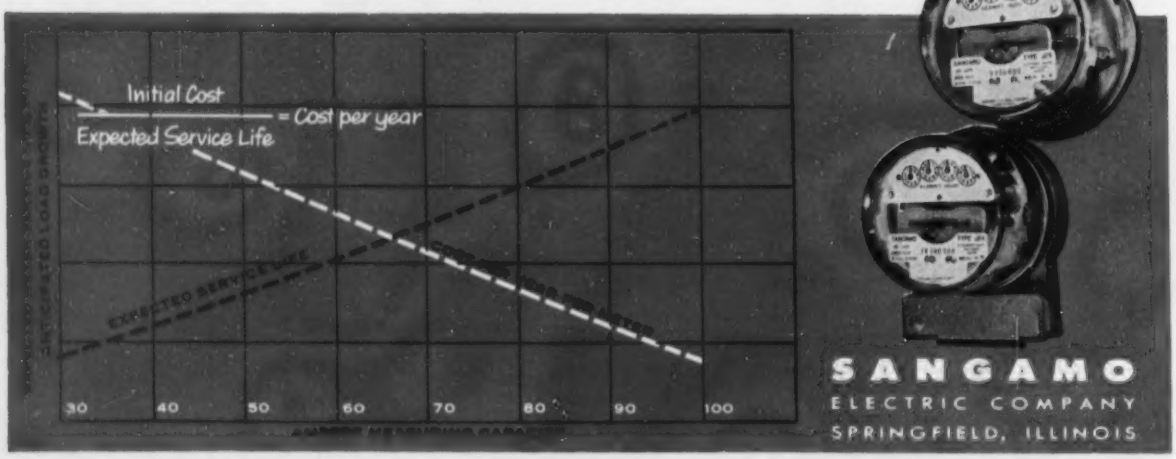
Over two hundred utilities with more than 25,000 customers on their lines have *invested* in nearly ¾ million J2 Meters since last March.

And their investments are protected because the J2 was designed specifically *to meet any future load growth.* If you divide the many years of service you can expect from a J2 Meter into its initial cost, the J2's cost per year is very low.

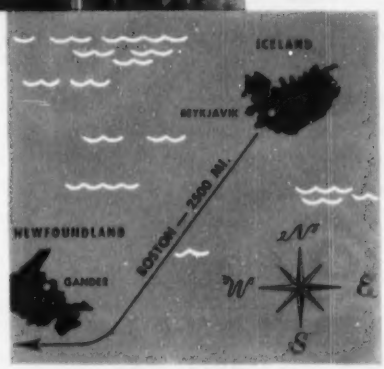
So when it comes to meters, choose the Sangamo J2 Watthour Meter, the first and finest 15 ampere meter with 100 ampere capacity . . . the meter that protects your investment in metering and lowers investment costs.

the FIRST watthour meter with straight line accuracy up to 100 amperes!

JM54-11



SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

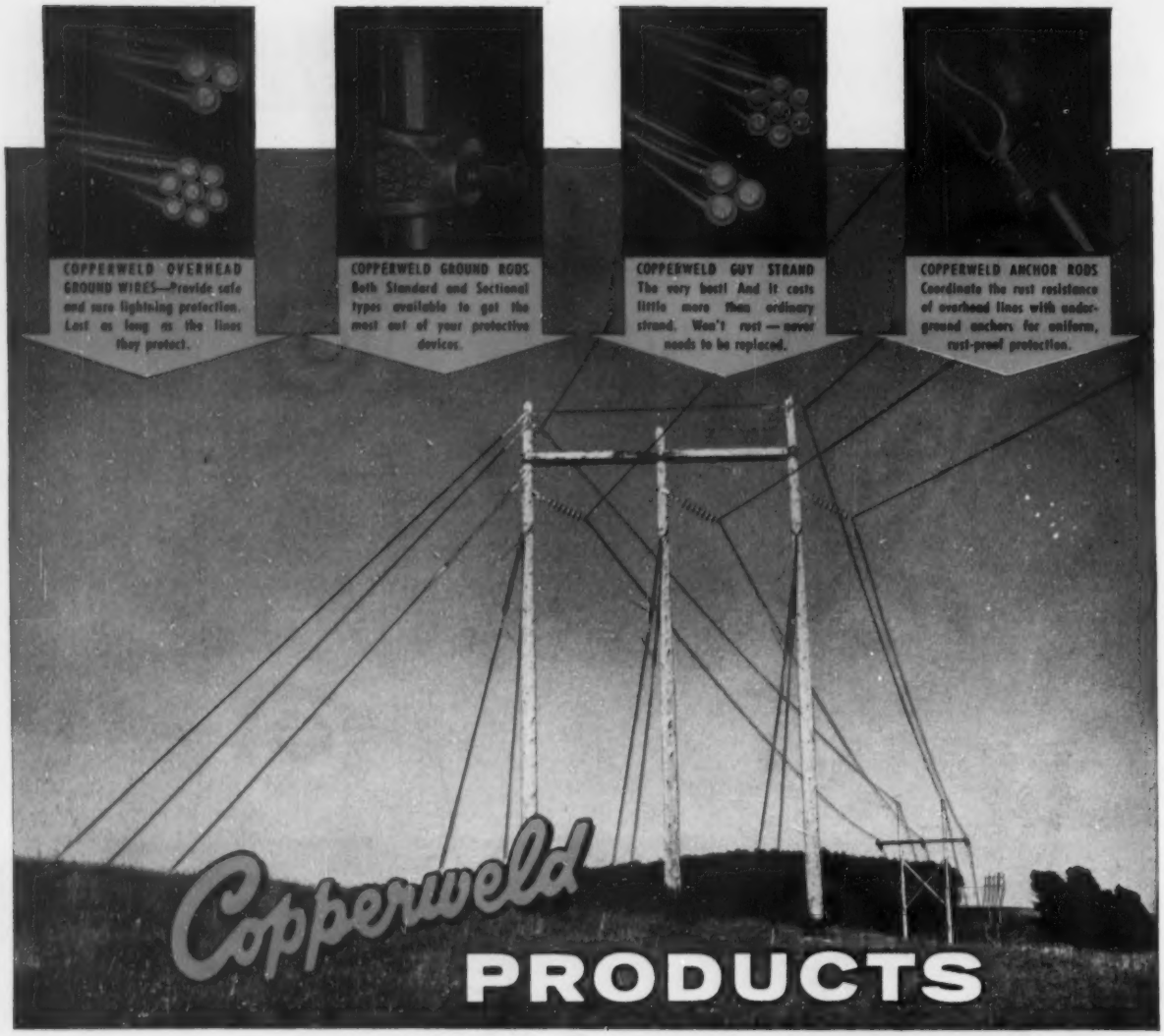


This headline from the Morgunbladid newspaper published in Reykjavik, Iceland announced that "The New High-Voltage Power Line From the Sogs-Waterfalls is Finished" This first high-voltage line to be built in Iceland brings power for new industries a distance of 35 miles from the Sog River to Reykjavik. The unusual terrain and difficult working conditions in Iceland made this another outstanding Hoosier installation. Because of Hoosier's long experience in handling difficult jobs, the work was done both efficiently and economically.

HOOSIER ENGINEERING CO.

ERECTION AND MAINTENANCE OF TRANSMISSION LINES

1384 HOLLY AVENUE • COLUMBUS 8, OHIO


COPPERWELD OVERHEAD GROUND WIRES—Provide safe and sure lightning protection. Last as long as the lines they protect.
COPPERWELD GROUND RODS Both Standard and Sectional types available to get the most out of your protective devices.
COPPERWELD GUY STRAND The very best! And it costs little more than ordinary strand. Won't rust—never needs to be replaced.
COPPERWELD ANCHOR RODS Coordinate the rust resistance of overhead lines with underground anchors for uniform, rust-proof protection.
Copperweld
PRODUCTS

For GROUNDING and GUYING

UNEQUALED in performance! UNRIVALED in long life! UNSURPASSED in economy!

Good engineering goes hand in hand with the best materials, especially for grounding and guying. That's why so many power systems, railroads and communication companies buy Copperweld* Products. There is no better way to keep overhead down and to be assured of constant, uninterrupted service. Use Copperweld Products on all your installations—it pays!

*Trade Mark

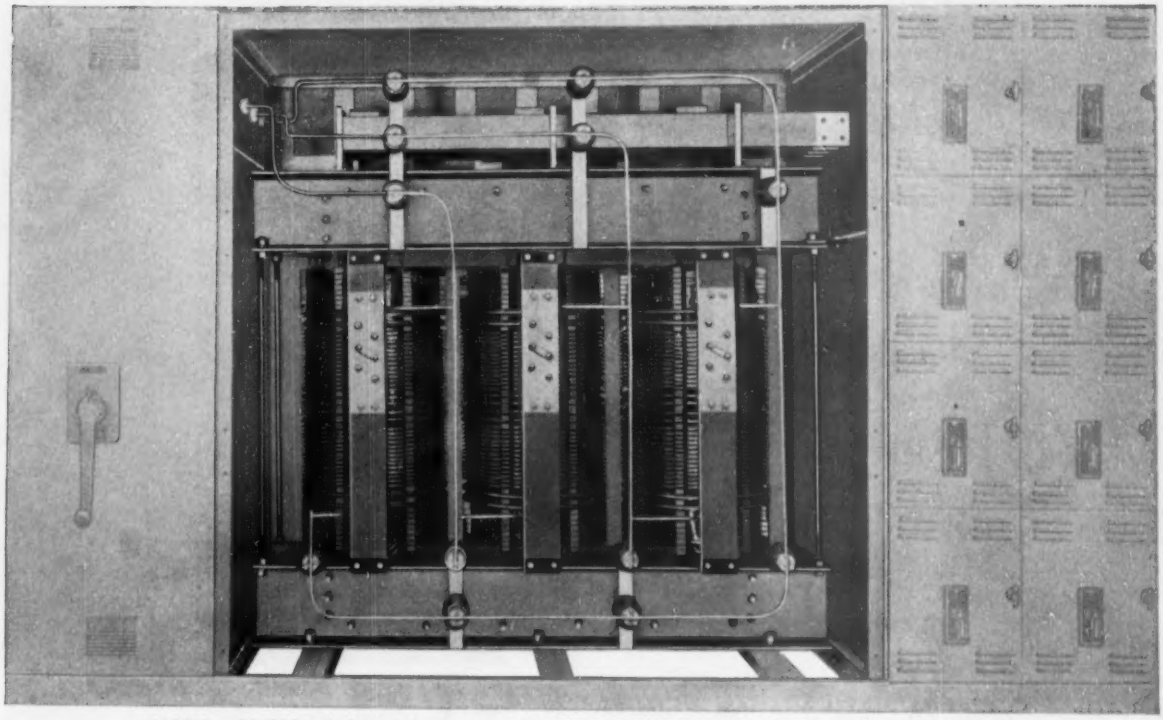
COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION Glassport, Pa.

SALES OFFICES IN PRINCIPAL CITIES
For Export: Copperweld Steel International Company, New York

Good Engineering Demands The Best Materials... Copperweld PRODUCTS

Combine the strength of steel with the conductivity and permanence of copper.

The transformer is the heart of a substation



1000 Kva 13,200 volt Sorgel dry-type transformer in a substation — (compartment panel removed)

500 Kva, 3-phase, 4160 to 480 Volt Askarel-cooled transformer, with primary and secondary throats

A substation is no better than its transformer; therefore, it is important that the transformer is of the best quality—a SORGEL transformer, either dry-type or Askarel-cooled.

Sorgel transformers are top quality, time tested, and are thus recognized and accepted by discriminating engineers and users. Their rugged construction assures continuous, reliable service. Their design is liberal. Efficiency is high. Quiet operation.

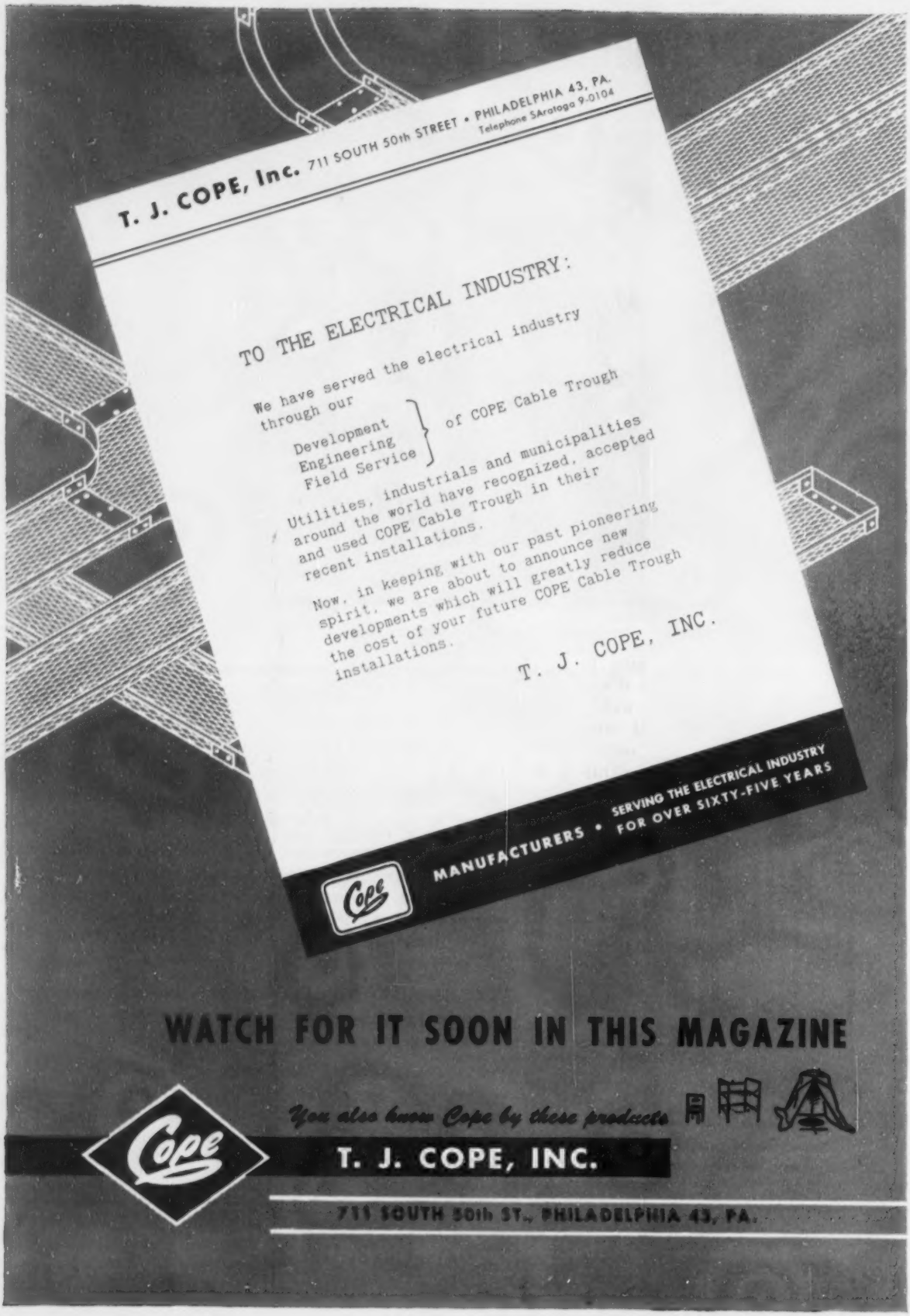
The Sorgel Electric Co. has 40 years of experience in the development, manufacturing and application of transformers.

Sorgel transformers, sizes 100 to 3000 Kva, all voltages up to 15,000 volts, either dry-type or Askerel-cooled, are procurable with any make or type of switch gear, and from any substation manufacturer.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Transformers—For 40 years


T. J. COPE, Inc. 711 SOUTH 50th STREET • PHILADELPHIA 43, PA.
Telephone SAratoga 9-0104
TO THE ELECTRICAL INDUSTRY:
We have served the electrical industry through our
Development
Engineering
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of COPE Cable Trough
Utilities, industrials and municipalities around the world have recognized, accepted and used COPE Cable Trough in their recent installations.
Now, in keeping with our past pioneering spirit, we are about to announce new developments which will greatly reduce the cost of your future COPE Cable Trough installations.
T. J. COPE, INC.
MANUFACTURERS • SERVING THE ELECTRICAL INDUSTRY FOR OVER SIXTY-FIVE YEARS
WATCH FOR IT SOON IN THIS MAGAZINE
You also know Cope by these products
Cope
T. J. COPE, INC.
711 SOUTH 50th ST., PHILADELPHIA 43, PA.

Consider the value of Graphitization studies...

...when critical power piping is the order

This is one field where gouging pays off handsomely . . . at least when it's done by the device pictured above, a weld prober which gouges out boat-shaped samples of metal from piping that has seen lengthy service under high-temperature, high-pressure conditions.

When these samples are polished, etched, and then diagnosed under metallographic microscope their evaluation provides basic information in studies of graphitization, the phenomenon which prior to 1943 was considered of only academic interest.

Through the microscope and by means of mechanical tests Kellogg metallurgists carry on a continuous search for evidence of graphitization. They are hunting particularly for what they call the "eyebrow" or chain type of graphite. It is these malformations that cause planes of weakness in carbon steel and carbon moly power piping . . . weaknesses that can result in serious failures.

Although exactly why graphite forms is not definitely known, metallurgists have already come up with positive methods of inhibiting it. Still Kellogg specialists continue their research, endeavoring to pinpoint the exact causes of graphitization and to improve fabricating techniques and materials. More than 6,000 test pieces have been gouged out of actual service piping and evaluated by Kellogg technicians in the past decade.

Continual metallurgical research such as this graphitization program is just one of the basic reasons why any utility company obtains a valuable plus when it specifies . . . *main steam and reheat piping by Kellogg.*

* * *

New Power Piping Booklet Published . . . Send for descriptive literature about Kellogg's extensive facilities for assuring the highest quality workmanship. A section of the booklet is devoted to detailed coverage of the K-Weld* process.

OTHER FABRICATED PRODUCTS include: Pressure Vessels . . . Vacuum Vessels . . . Fractionating Columns . . . Drums and Shells . . . Heat Exchangers . . . Process Piping . . . Bends and Headers . . . Forged and Welded Fittings

FABRICATED PRODUCTS DIVISION

THE M. W. KELLOGG COMPANY

225 Broadway, New York 7, N. Y.

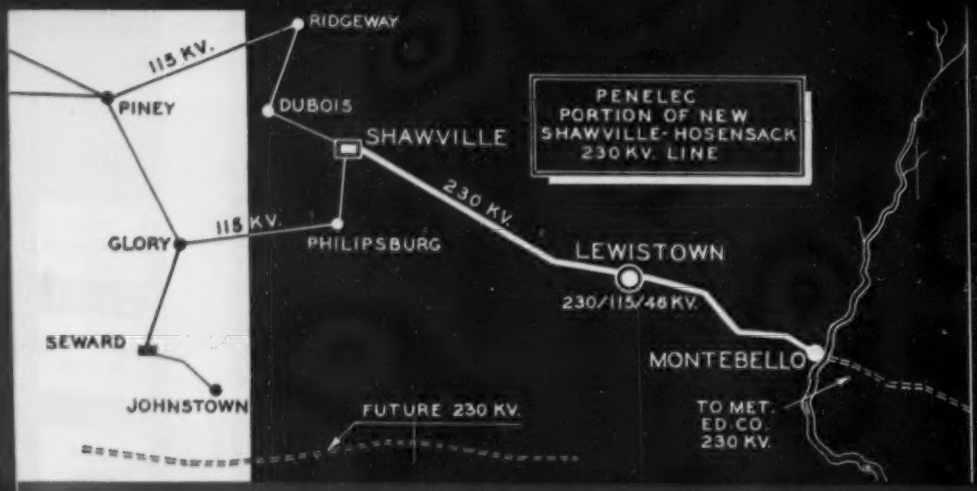
In Canada—The Canadian Kellogg Company, Limited, at Toronto and Edmonton

In Europe—Kellogg International Corporation, at London

*Trade-mark of The M. W. Kellogg Company

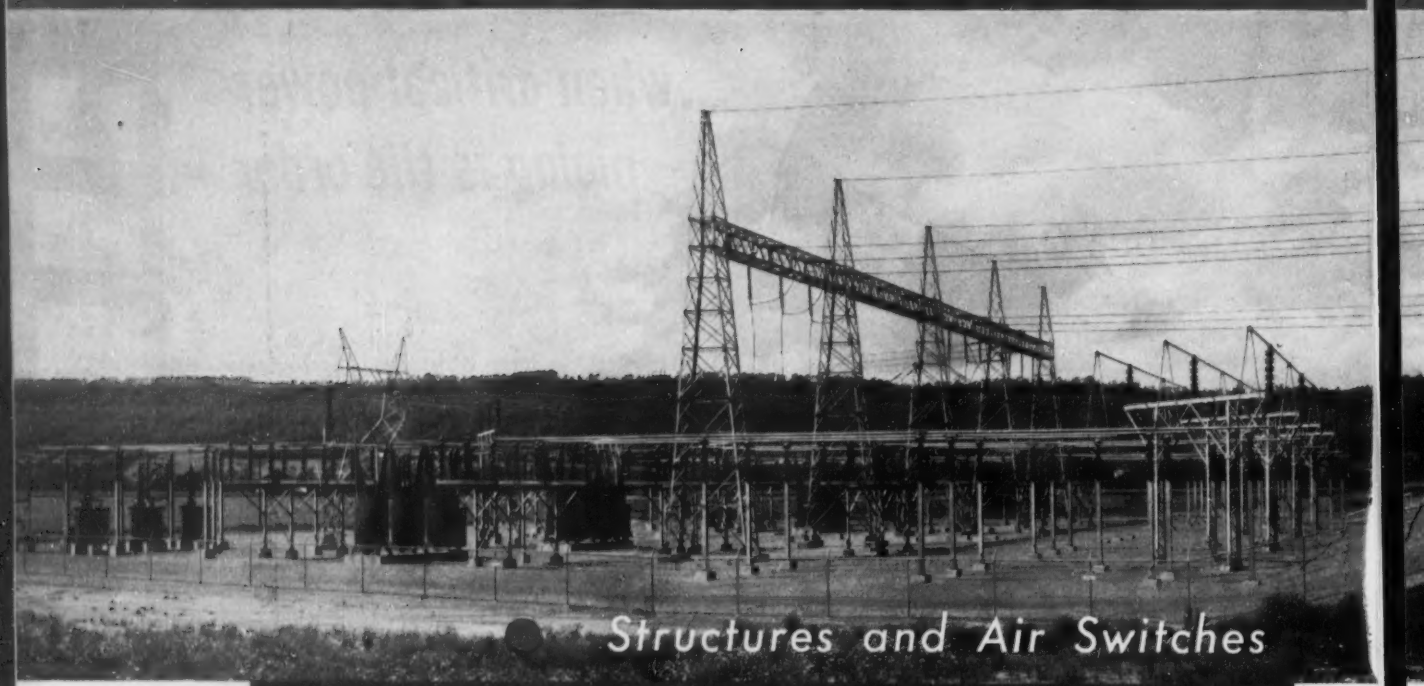
KELLOGG PULLMAN

KELLOGG HIGH TEMPERATURE HIGH PRESSURE POWER PIPING



W. C. SONTUM
V. P.—TECHNICAL DEPTS.

LEWISTOWN SUBSTATION PROVIDES



Structures and Air Switches

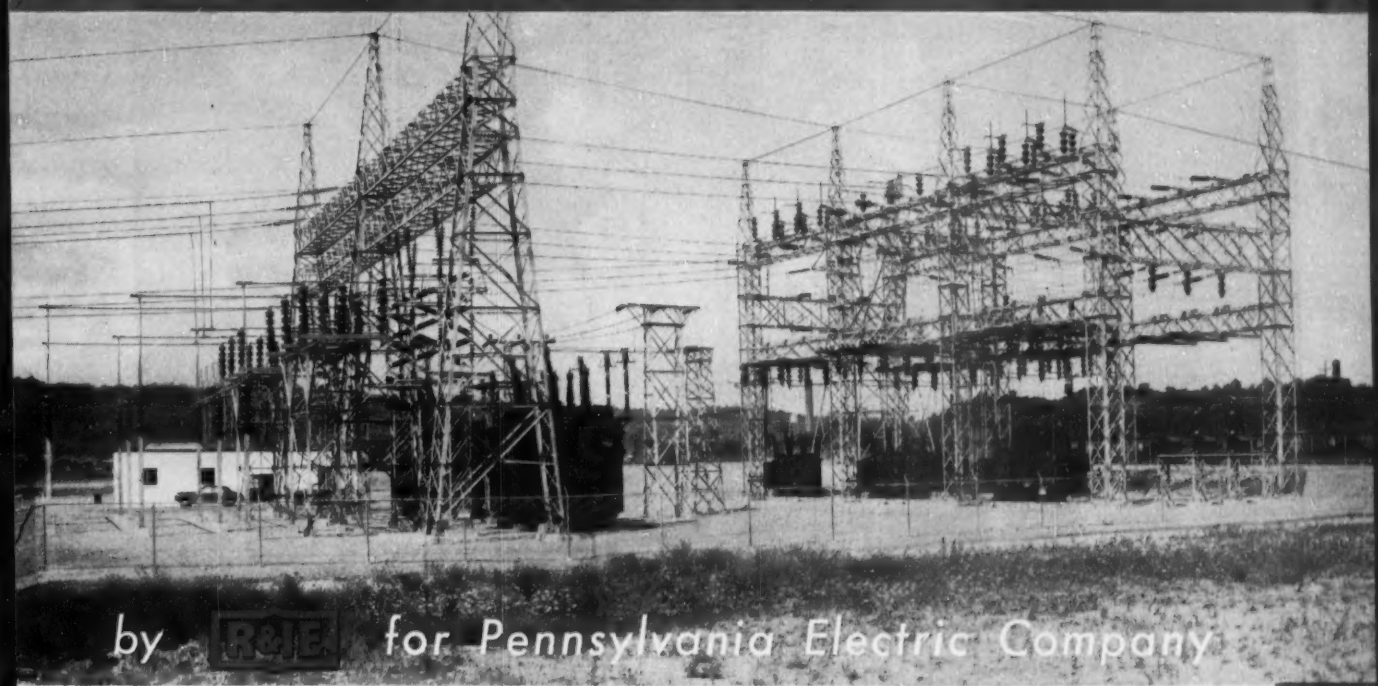
"This new Lewistown Substation is the first completed in the 200 mile line of 230 Kv transmission, from Shawville to Hosensack, Pa. At Montebello it joins the Metropolitan Edison Co. and the interconnection provides facilities for the exchange of large blocks of power to either side of the mountains.

The 115 Kv outgoing lines feed the Penelec system, while the 46 Kv lines feed the local area. Future additions which can be added are — another 230 Kv line, another 115 Kv line and two more 46 Kv lines.

Lewistown Substation is considered a highly important link in the Eastern high voltage system."

Although unusual in layout, the Lewistown Substation, requiring 6 acres of ground, generally follows Penelec standard design, especially the 46 Kv and the 115 Kv structures. For the 230 Kv switches, beam type racks were designed for the increased stress required. Dead-end towers required five foot square trusses. Special conductor fittings were designed for use with 4" aluminum bus. Special trusses were designed for suspension type lightning arresters. A total of 447,280 pounds of galvanized steel was required.

230 K.v. FOR PENELEC . . .



by R&IE for Pennsylvania Electric Company

PARTNERS IN PROGRESS

When a public utility contemplates important additions to its system, it must have a reliable, and experienced manufacturer as partner in the enterprise.

This 230 Kv substation required thoughtful planning by Penelec engineers, and careful design by R&IE. From the drafting board to the completed job, the engineering of a properly co-ordinated substation is a problem for the specialist. Many such specialists, from the utility and the manufacturer, added their skills to produce Lewistown Substation.

R&IE, with forty-four years of construction experience, can be your manufacturing partner, too. Whether your substation problem is large or small, R&IE will produce a steel or aluminum structure correct in all details—mechanically and electrically. Remember, too, that R&IE Substation Service is controlled at one place—one responsibility for the design, fabrication, and application of blade switching equipment.

R&IE SWITCHING EQUIPMENT

DIVISION OF I-T-E CIRCUIT BREAKER CO.,

GREENSBURG, PA.

BUS STRUCTURES • INTERRUPTER SWITCHES

STRUCTURES—steel or aluminum • TESTING OF

INDOOR BUS SUPPORTS and BUS FABRICATION • OUTDOOR BUS SUPPORTS and AIR SWITCHES • SUBSTATION

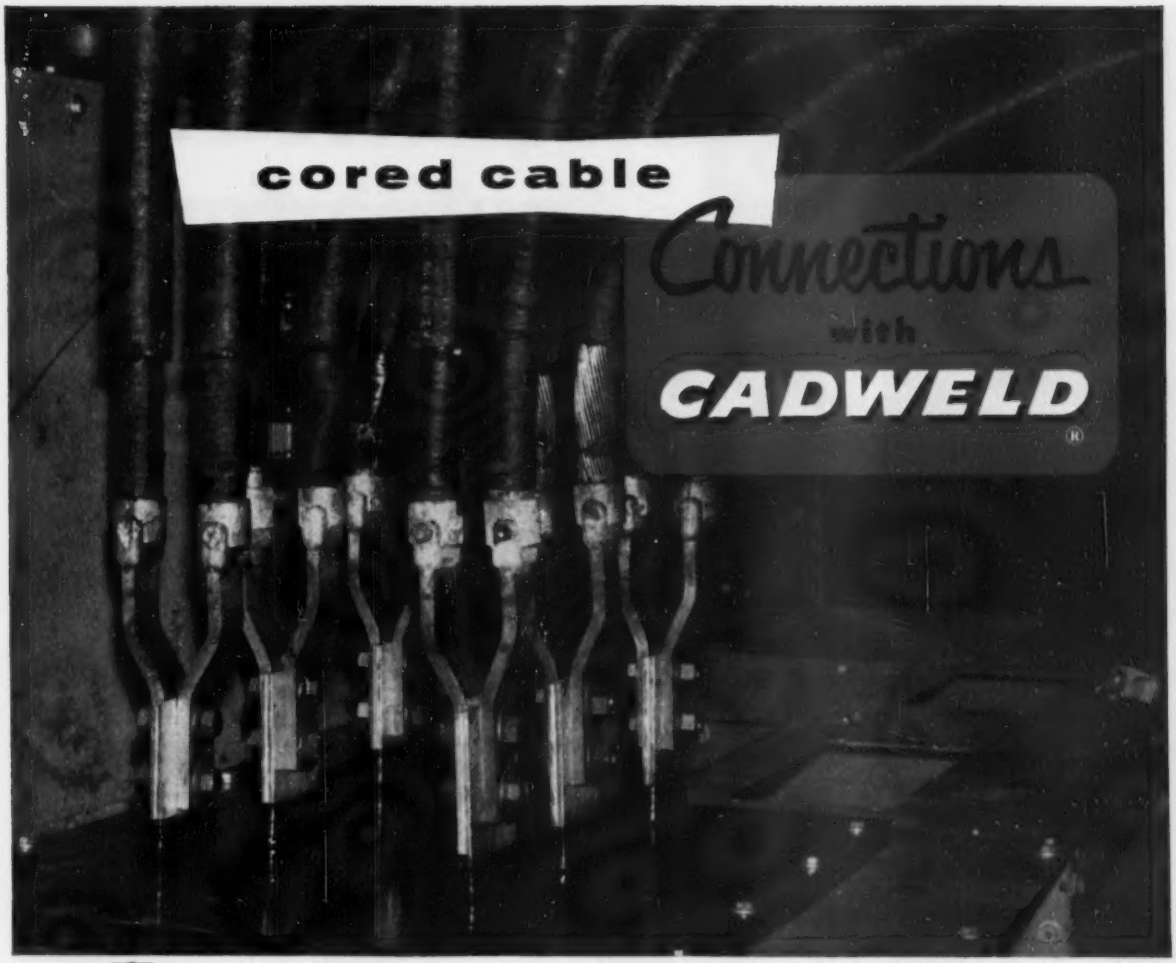
Pioneering New Horizons
our specialty . . .

FROM THE FIRST MOMENT Pioneer is retained to help you plan your new electric power station, Pioneer becomes a part of your company, thinking and planning in your best interests . . . Pioneer has 52 years of experience to aid in determining the necessary plant capacity and its construction cost, to select the site and design the generating station . . . Pioneer will also design any needed service or office buildings and act as your agent in purchasing construction supplies and materials . . . Pioneer offers complete valuation, depreciation and rate services . . . .it will supply stock transfer and dividend distribution services . . . Our consulting staff provides experienced advice on company management, corporate finance, accounting and taxation matters . . . a well-rounded schedule to relieve your overload periods.

For complete information on Pioneer's services, write for our factual booklet, "Pioneering New Horizons", yours for the asking.

Pioneer Service & Engineering Co.
231 South La Salle Street · Chicago 4, Illinois

PSE 52 YEARS



1,250,000 CM cable with ¾" hemp core CADWELDED to ½" x 2" copper bar lugs at the Ashtabula power plant of The Cleveland Electric Illuminating Company.

CADWELD CONNECTIONS are the best on any type of cored cable because:

1 They do not require mechanical pressure for contact.

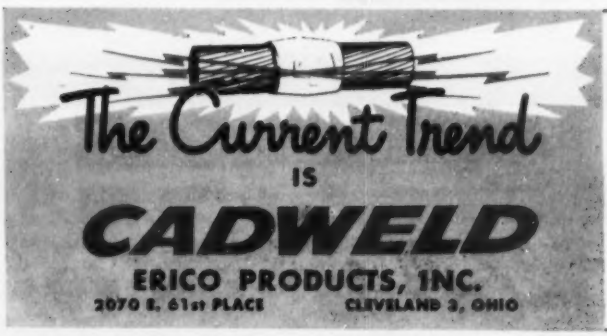
2 They cannot loosen or corrode.

3 They have greater current carrying capacity—keeps connections operating cooler than the cable.

4 They are compact—simplifies reinsulation.

FOR THE BEST IN ELECTRICAL CONNECTIONS

1750 MCM air cored cable CADWELDED to ½" x 3" x 8" lug



ERICO PRODUCTS, INC.
2070 E. 61ST. PLACE CLEVELAND 3, OHIO

☐ Send Descriptive Literature on CADWELD Electrical Connections

☐ Please have representative call.

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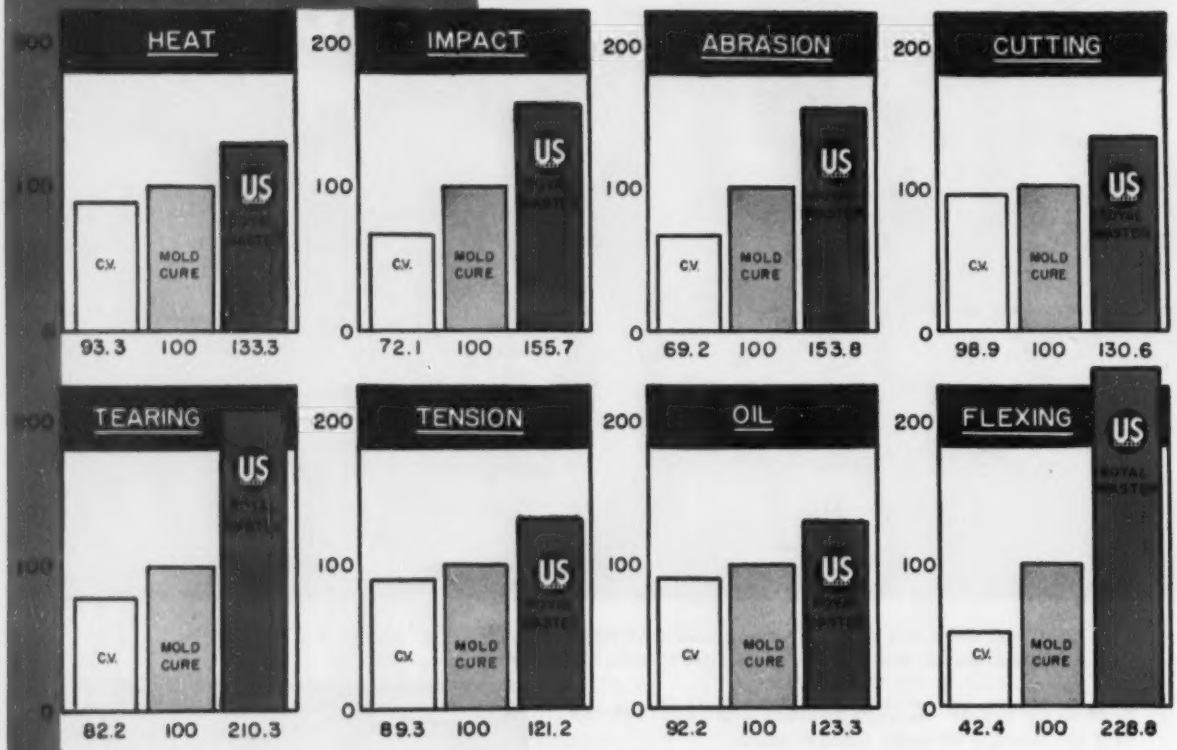
COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

New U.S. ROYAL outperforms,



Comparative performance of portable cords related to major life factors.

Graphs illustrate the outstanding superiority of new U. S. Royal Master Cord—over the average of molded cords and the average of short-lived continuous vulcanized cords of other makes—on every major life factor. (Average of other molded cords is rated at 100%.)

US RUBBER

UNITED STATES

ELECTRICAL WIRE AND CABLE DEPARTMENT

MASTER portable cord *outlasts all others!*

Comparative tests show U. S. Royal Master gives $1.88 in value for every $1.00 spent — almost *twice* the service value of the average of other molded cords!

Two years ago, "U. S." engineers began a *complete reexamination* of portable cord construction, service life, and the causes of cord failure.

Over 10,000 tests were made. More than a thousand cords of all leading makes, including our own famous U. S. Royal Cord, were analyzed, tested, and compared.

Every life factor was considered and carefully evaluated, alone and in its relation to overall cord performance and service life.

Backed by 64 years of experience in the manufacture of electrical wire and cable, U. S. Rubber engineers then translated their findings into an entirely new portable cord, designed to surpass any other previously made.

Extensive tests, both in the laboratory and in outside plant installations have proved this new portable cord startlingly superior in every respect!

New U. S. Royal Master is unquestionably the finest cord you can buy!

From every standpoint, as the charts at left illustrate, new U. S. Royal Master is a finer, more durable cord—actually gives 88% longer life than the average of competitive molded cords—far longer than *any* other cord—surpassing even a hypothetical cord incorporating the best features of all those tested!

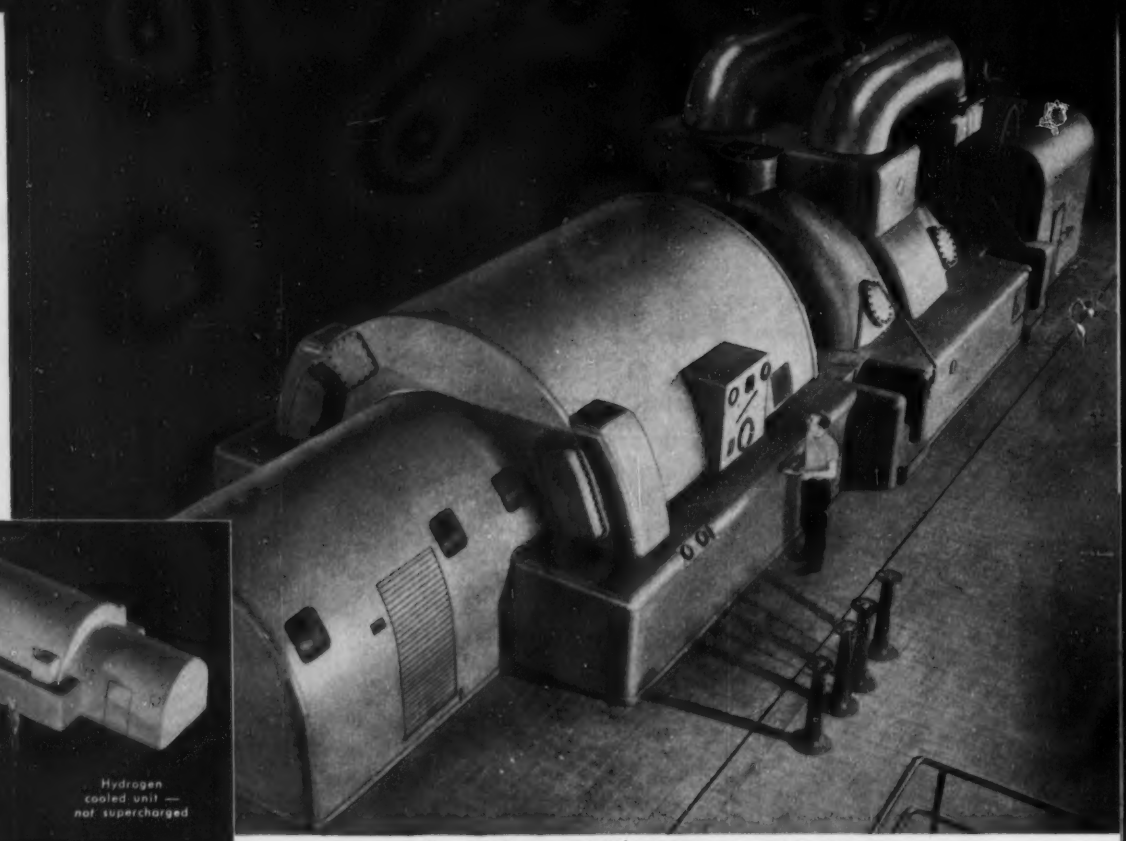
Far greater value, too! In spite of almost doubled service life, this great new cord is in the same price category as other molded cords—giving you $1.88 in cord value for every cord $1.00!

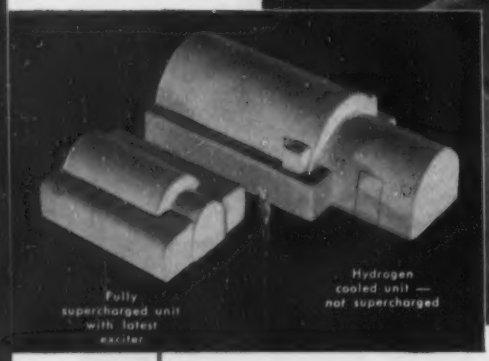
Prove to yourself the outstanding superiority of new U. S. Royal Master Portable Cord — in both service life *and* economy! Get in touch with your "U. S." distributor today!

Approved by Underwriters' Laboratories, Inc.

RUBBER COMPANY

ROCKEFELLER CENTER, NEW YORK 20, N. Y.

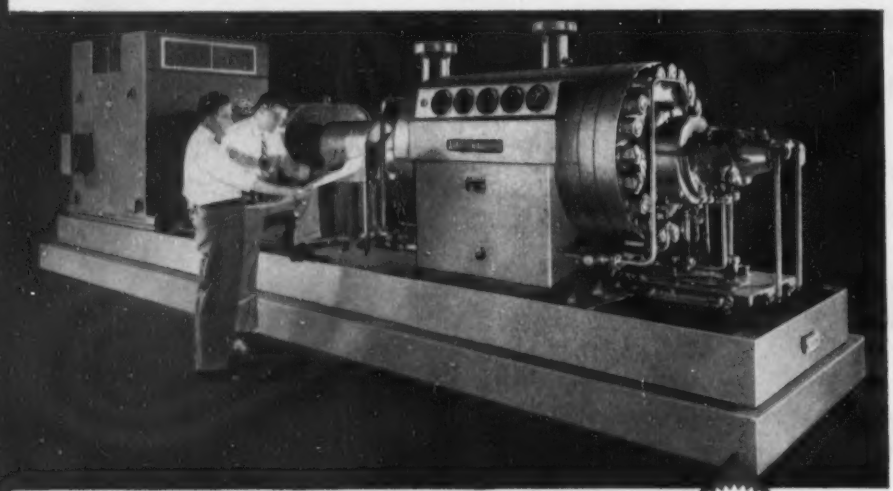




Supercharged Hydrogen Cooling! The first trend-setting rotor supercharged steam turbine generator unit established availability record of 99.86% during first two calendar years. Models of generators at left clearly show relative size reduction obtainable with fully supercharged cooling.

ALLIS-CHALMERS
Utility Equipment

Here are just a few of the many developments introduced by Allis-Chalmers in the last few years for the fast-moving utility industry. For information on any of these items call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.



Developments in Motors and Pumps for Boiler Feed Service

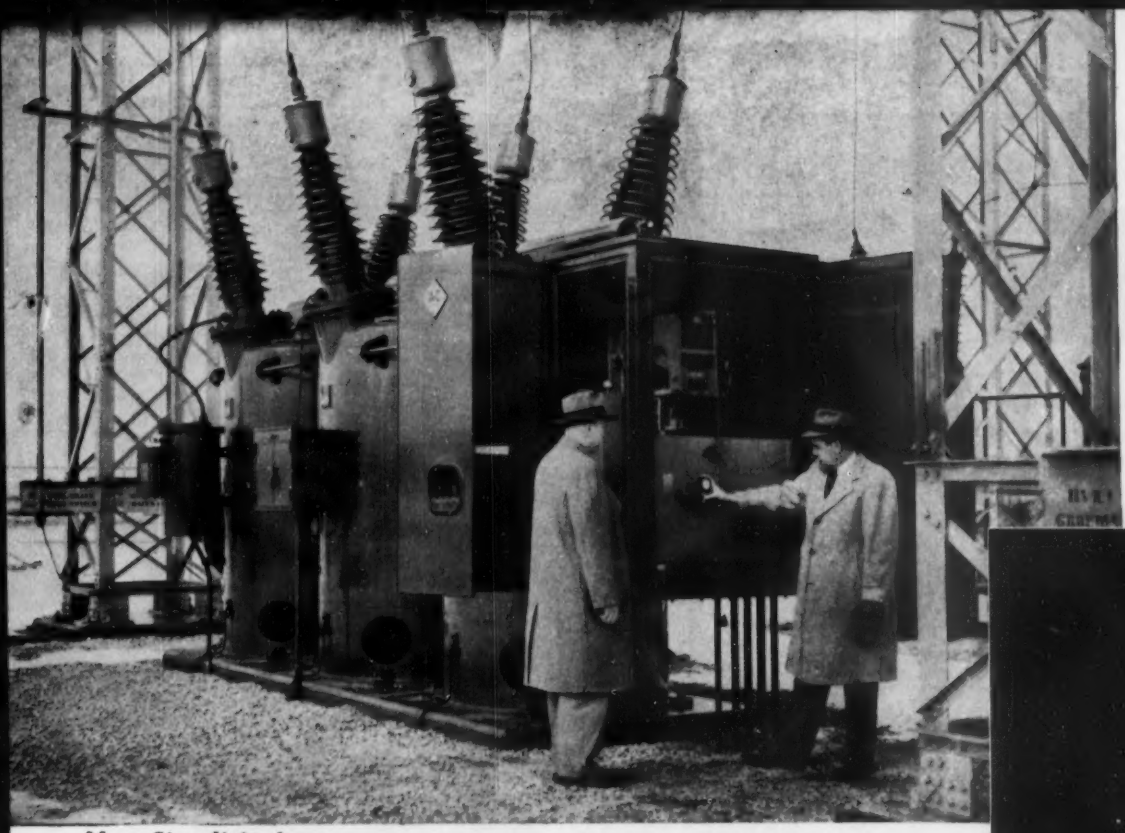
Redesigned Two-Pole Motor — Top air intake and discharge plus spiral stator core ventilation are now featured. Top air discharge permits closer mounting of motors. Spiral ventilation assures even internal cooling... helps reduce noise. In addition, motor has modern appearance and new capsule-type bearings are provided.

Latest Boiler Feed Pump — Recent refinements include simplified oil piping arrangement and lagging around barrel to permit insulation of barrel and provide improved appearance. Pump is barrel-type for high efficiency, high pressure service. Single stage back-to-back impellers balance axial forces without use of balancing drum. Double volute casings balance radial forces.

Pneu-Draulic is an Allis-Chalmers trademark.

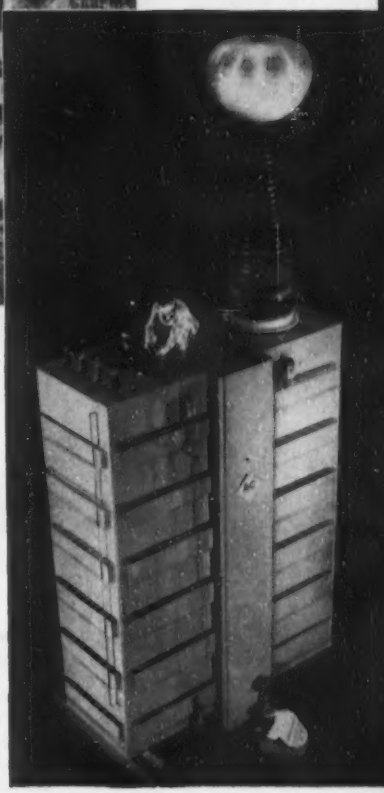
A-C ALLIS-CHALMERS

ALLIS-

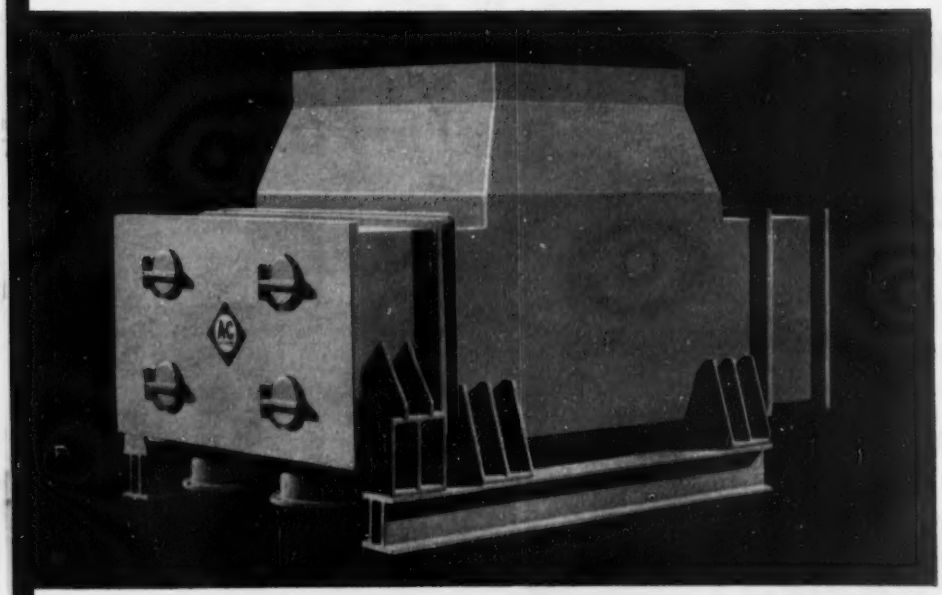


New Simplicity! *Pneu-Draulic* operating mechanism for breakers utilizes hydraulic principle instead of air. This reduces dirt and moisture hazards, adds reliability to breakers. These 115-kv breakers with *Pneu-Draulic* operators have been in service more than a year.

Developments



A Look At Tomorrow!
This 5000-kva power transformer, designed for 600 or 800-kv service, was built to help advance engineering knowledge toward possible future requirements.



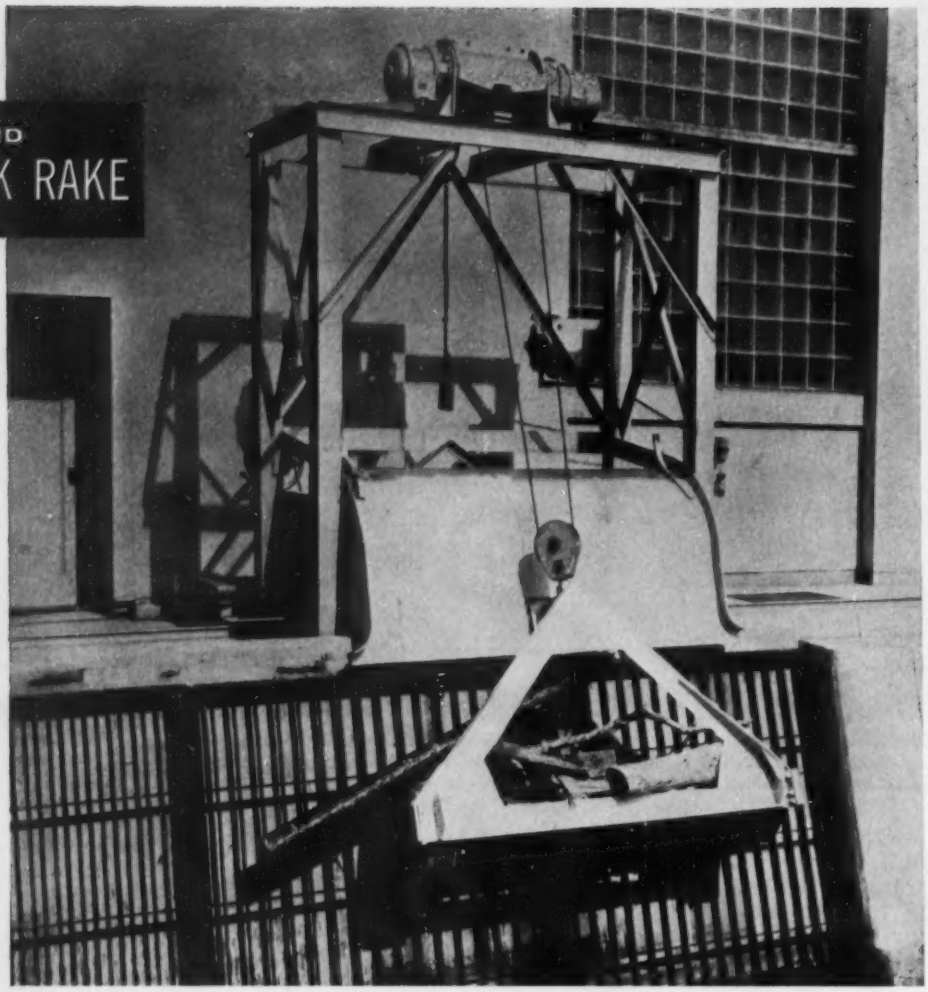
Space-Saving Condenser! Latest 100,000-square-foot condenser, now being built, illustrates trend to rectangular shape, which permits savings in plant construction cost. Model allows unusual view of unit. This condenser features multi-steam path design for low "terminal difference," high condensate temperature and low absolute pressure.

A-4454

CHALMERS

LEONARD

TRASH RACK RAKE



NO GUIDES – better performance and greater economy

Leonard rakes operate without guides directly on trash rack bars . . . ride down over stubborn obstructions and work them loose. This freedom of movement assures fast, easy cleaning of the rack bars. No channel guides need be attached to bars or embedded in concrete piers. The initial cost is much less because the width of Leonard rakes can be kept to a minimum and the expense of guides eliminated.

Rake teeth parallel rack bars to clear debris and obstacles on descent, tilt to a perpendicular position when ascending and carry all extraneous matter to the unloading position. Operation is by an electric hoist on either inclined or vertical stationary rack bars.

For information on Leonard trash rack rakes and other accessories, as well as the design and manufacture of hydraulic turbines, write to S. Morgan Smith Company, York, Penna.

Hydraulic Turbines
Pumps
Gates & Hoists
Trash Rakes
Accessories

HYDRODYNAMICS

Rotovalves
Ball Valves
Butterfly Valves
Free-Discharge Valves
Controllable-Pitch Ship Propellers

S. MORGAN SMITH CO.

AUTOMATIC STARTERS

Bulletin 709 solenoid starters in 8 sizes up to 300 hp, 220 v; 600 hp, 440-550 v. Enclosures available for every kind of operating condition.

MANUAL STARTERS

Bulletin 609 manual starters in 2 sizes up to 5 hp, 220 v; 7½ hp, 440-550 v, with 2 accurate thermal overload breakers.

OILTIGHT STATIONS

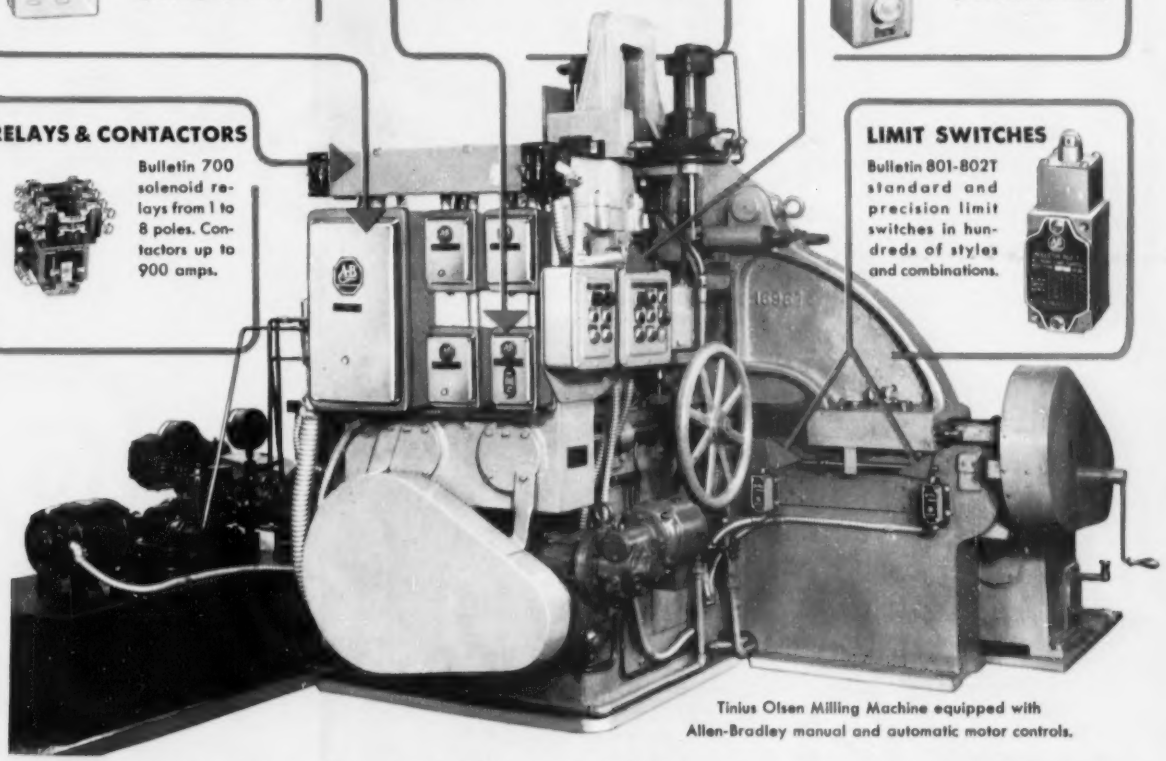
Bulletin 800T oiltight push buttons for machine tool service. A full line, with or without pilot lights, and single or multiple push button stations.

RELAYS & CONTACTORS

Bulletin 700 solenoid relays from 1 to 8 poles. Contactors up to 900 amps.

LIMIT SWITCHES

Bulletin 801-802T standard and precision limit switches in hundreds of styles and combinations.



Tinius Olsen Milling Machine equipped with Allen-Bradley manual and automatic motor controls.

WHEN YOU ARE UP AGAINST A MOTOR CONTROL PROBLEM

Look for the answer IN THE A-B HANDY CATALOG

Motor control requirements are becoming more and more complex . . . with more limit switch circuits . . . more relays . . . more timers . . . more push buttons. You can find the right combination of control units in the Allen-Bradley Handy Catalog—have a copy on your desk for quick and easy reference. It is a 120-page motor control guide with ratings, dimensions, and prices of starters, relays, limit switches, drum controllers, rheostats, push buttons, and many other accessories.

Look for the answer to your motor control problems in the Allen-Bradley Handy Catalog. Write for your copy, today. Remember, Allen-Bradley control is Quality Control!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited—Galt, Ont.

ALLEN-BRADLEY

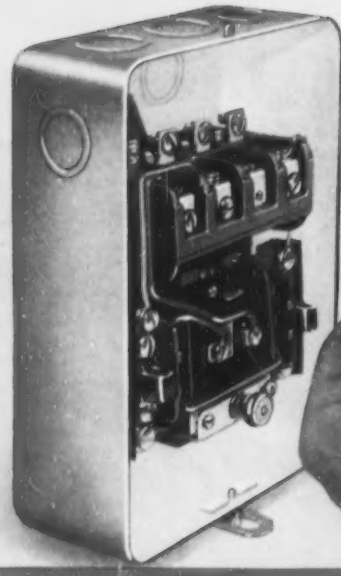
QUALITY

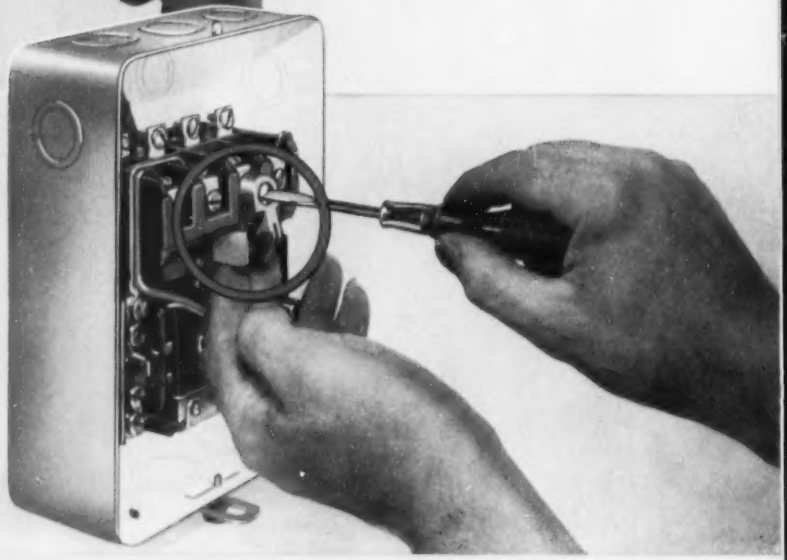
TROUBLE FREE MOTOR CONTROLS

10—54—M

AUXILIARY CONTACTS

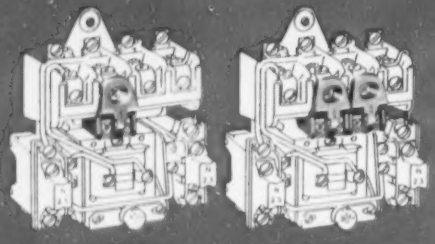
SO EASY TO INSTALL on ALLEN-BRADLEY Solenoid Starters





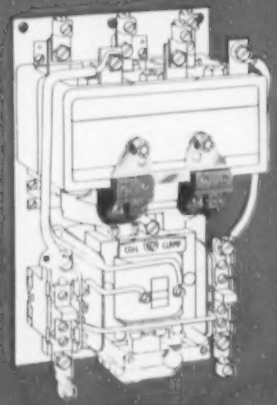
SIZE 1 AUXILIARY CONTACT

Contact block showing bakelite operating lever.



Bulletin 709 Size 1 solenoid starter with one auxiliary contact on hood.

Same starter equipped with two auxiliary contacts on the arc hood.



Bulletin 709 Size 3 solenoid starter with two Bulletin 895 auxiliary contacts on one mounting plate, which is attached to the arc hood of the A-B solenoid starter.

The same mounting plate, with either one or two auxiliary contacts, can be used interchangeably on Size 2 and Size 3 solenoid starters.

Existing control wiring need not be disturbed to install Bulletin 895 auxiliary contacts on an A-B starter.

All Bulletin 895 auxiliary contacts have "Pilot Duty Rating."

NOW—with these new Bulletin 895 auxiliary contacts, you can add to your Allen-Bradley starters extra pilot circuits for operating relays or pilot lights. They are quickly attached to the arc hoods of Sizes 0 to 3 solenoid starters. (See line drawings at left.)

Two contact arrangements are available... one has either a normally open or a normally closed contact... easily changed from one to the other. The other has both a normally open and a normally closed contact. Bulletin 895 contacts are available for Sizes 0 and 1 starters, while the construction for Sizes 2 and 3 starters is the same.

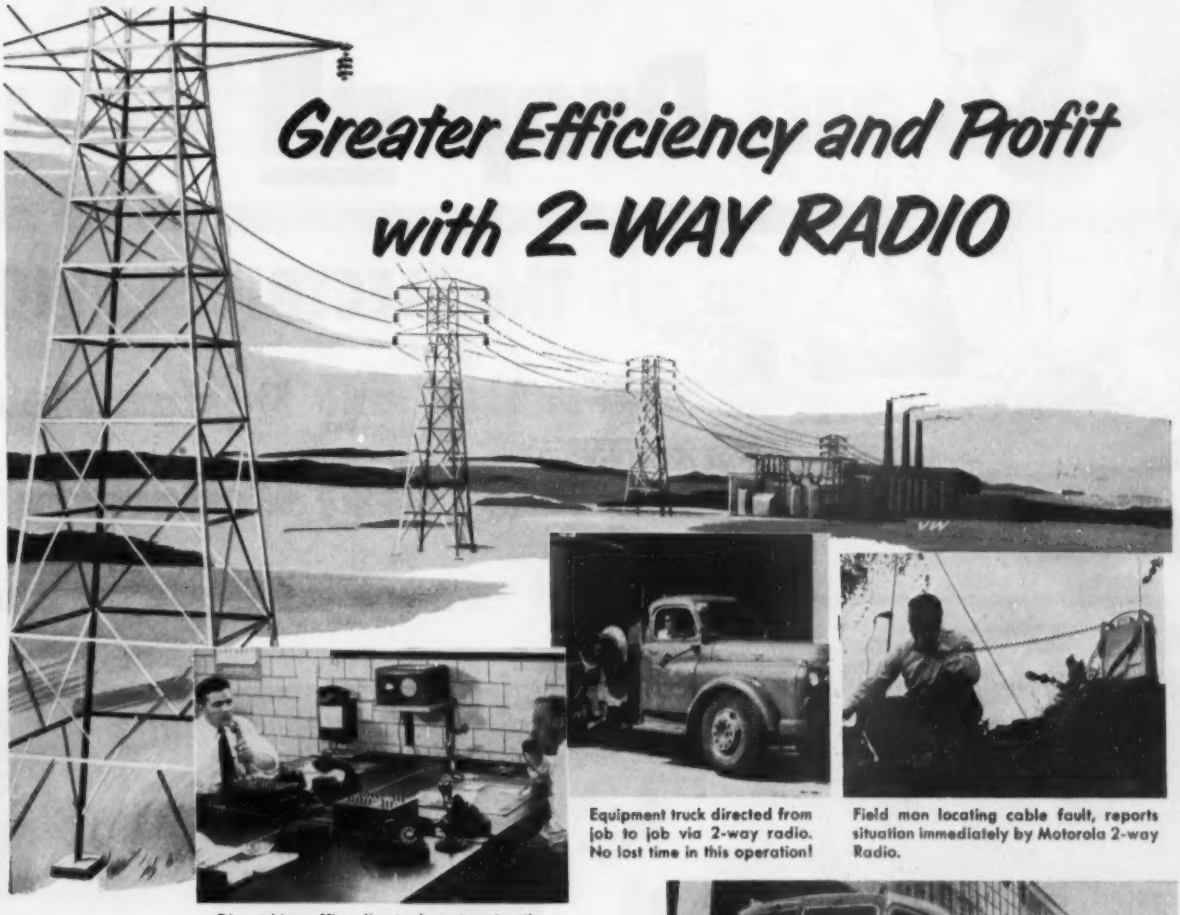
These auxiliary contacts are operated by the solenoid plunger. Terminals are front connected. The double break, silver alloy contacts need no maintenance.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited—Galt, Ont.

ALLEN-BRADLEY
QUALITY
TROUBLE FREE MOTOR CONTROLS

10—54—M

Greater Efficiency and Profit with 2-WAY RADIO



Dispatching office directs department action in the field . . . radio saves dollars for every department using it.

Equipment truck directed from job to job via 2-way radio. No lost time in this operation!

Field man locating cable fault, reports situation immediately by Motorola 2-way Radio.

Versatile, Practical Communication Tool Gives Complete, 24 Hour Operational Control Over Power Systems . . . Increases Service Continuity . . . Cuts Maintenance Costs!

Central control through Motorola communications systems makes possible maximum continuity of service at minimum cost . . . a fact proven by leading power utility companies from coast to coast. Here are some of the situations where time-and-labor-saving Motorola 2-way Radio helps you to give better service:

- Reporting grounded lines, minimizing outage time
- Expediting requests for line repair equipment
- Fast, on-the-spot reporting of line work progress
- Greater team efficiency in repair and maintenance
- Saves lost man-hours and wasted vehicle mileage
- Test-energizing of new stations
- All emergency situations

All-weather, 24-hour dependability makes Motorola a rugged companion to line crews on tough duty. Complete 6/12 volt interchangeability, all vibrator power supply, low battery drain, and greater audio power are specified features of Motorola's electronic excellence and value. See the Motorola communications engineer in your area soon . . . he'll be glad to give you the complete 2-way radio story.

Driver of cable truck takes call while on route, makes one trip service more crews' needs.

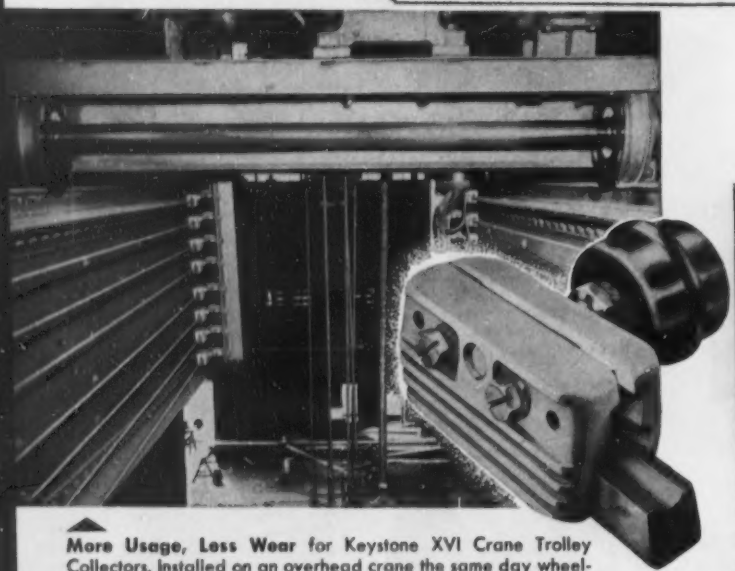
national
Motorola 2-way Radio
service

Motorola Communications & Electronics, Inc.
A SUBSIDIARY OF MOTOROLA, INC.
4501 W. Augusta, Chicago 51, Ill. • Rogers Majestic Electronics, Ltd., Toronto, Canada

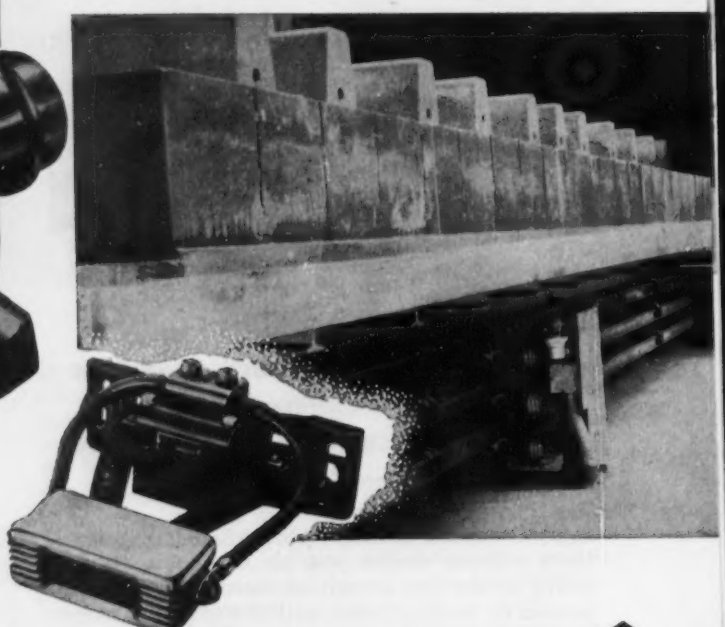
Drop all your

The ELECTRIC SERVICE

1. Design New
2. Modernize
3. Recommend



More Usage, Less Wear for Keystone XVI Crane Trolley Collectors. Installed on an overhead crane the same day wheel-type collectors went on a similar crane, they were in operation 50% longer each day. When wheels were removed due to failure, the XVI renewable carbon shoe contact inserts still had many months of life ahead.



Long, Hard, Hot Service at Birdsboro Steel Foundry & Machine Co. Loaded furnace cars move in and out of heat treating furnaces safely and without a hitch. Rails on each furnace car contact stationary columns equipped with Keystone LMI Pony-size Contact Rail Collectors. These reversible collectors offer 30% greater contact travel, efficient current transfer.

Rugged Reliability in the face of dirt, rainy and icy conditions, and severe misalignment. These Keystone Inverted-V Universal Collectors have operated for more than seven years at the Alan Wood Steel plant. They give positive contact wherever the going is rough, tough, and dirty—in open hearth, coke plant, blast furnace.

ELECTRIC SERVICE MANUFACTURING CO.,

third-rail problems on his desk!

Engineer will collaborate and . . .

Keystone Conductor System (Steel, Aluminum or Copper)

your Present System for Greater Efficiency and Economy

Suitable ESM Equipment for the Job

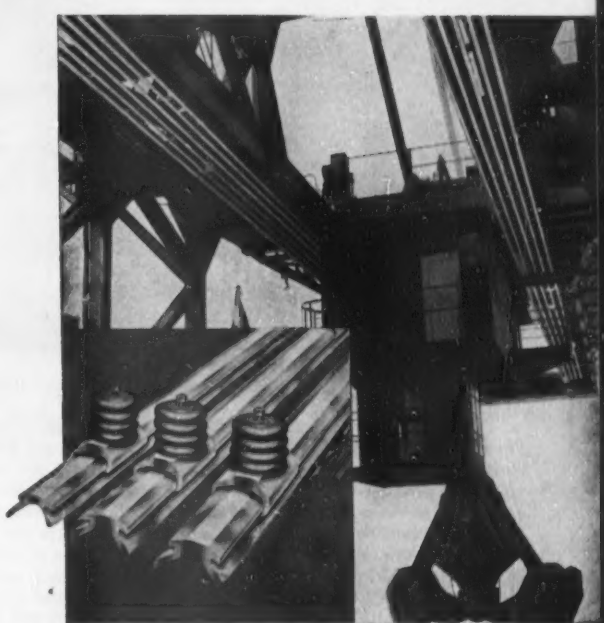
INDUSTRIES rely heavily on the Electric Service engineer for designing or converting power Conductor Systems. There are three main reasons:

ESM ALUMINUM, STEEL, COPPER SYSTEMS—All three are designed and built by Electric Service. Each has its proper applications, resultant economies. The system specific to *your* needs is recommended without bias.

ESM SERVICE IS COMPLETE—Engineering counsel is backed up by the complete line of Keystone Equipment and by ESM installation specialists. Electric Service engineers new systems, modernizes inadequate systems, repairs existing systems.

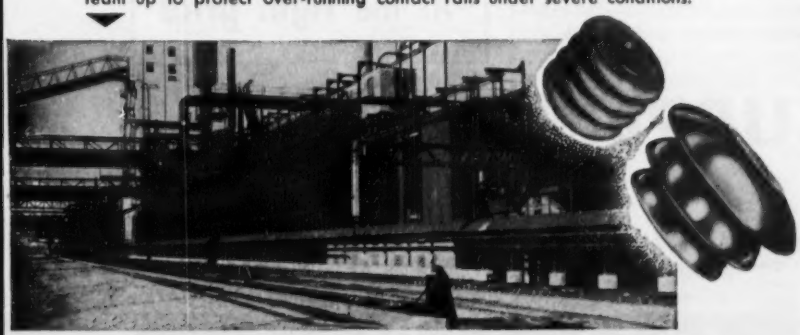
ESM PRODUCTS ARE JOB-PROVED—They're at work on all types of materials handling equipment in every industry—steel mills, power plants, docks, rail yards, processing plants. Typical installations shown here illustrate the scope and reputation of Electric Service in this electrical power-transmission field.

What's your problem?—insufficient power? . . . severe weather or corrosion conditions? . . . production-sapping shutdowns? . . . excessive maintenance? Write today for assistance.



Aluminum Reduces Corrosion, cuts deadweight for Canton Co. Baltimore Harbor's salty dampness doesn't faze Keystone Integrated Aluminum Conductor System. High-speed ore unloader utilizes aluminum on trolley conductors and on 1200-ft., 2300-volt main runway. Aluminum Under-running System has high current capacity, low voltage drop, sensitive control.

Unhurt by Volts, Jolts are the Keystone Insulators on Fairless Works coke oven rails. Petticoat-type Porcelain Insulators resist contamination by dirt, moisture. Shock-proof, non-absorbent moulded type Insulators team up to protect over-running contact rails under severe conditions.



KEYSTONE
INDUSTRIAL
POWER
PRODUCTS

Philadelphia 32, Pa.

Represented in Canada by Lyman Tube and Bearings, Ltd., Montreal and Toronto

WHY IT PAYS TO BUY MECHANICAL TUBING FROM US

● There's no need of sacrificing large areas of valuable floor space for tubing storage when those areas *could* easily be made productive. Why not let *us* carry the storage and handling costs?

Our warehouses stock an exceptionally large variety of tubing products . . . in fact, no less than 531 sizes of Shelby Seamless Mechanical Tubing are readily available! So you can always count on quick delivery of exactly the type and size tubing you need . . . whether your order is by the inch or by the carload. And all our tubing products are made by the world's leading manufacturer of fine tubing and pipe —National Tube Division of U. S. Steel.

And, our extensive experience with tubing problems has often led to customer savings. For in many cases, our engineers can suggest a more economical type of tubing for your application.

Contact our nearest warehouse the next time you need quality tubing of any sort and in any quantity from our stock or directly from the mill: mechanical tubing, round and square, seamless and welded; boiler tubing, pressure tubing and pipe; and stainless steel tubing and pipe, seamless and welded.

TRIPLE SECURITY

What you want
When you want it
At the **right price**

U. S. STEEL SUPPLY
DIVISION

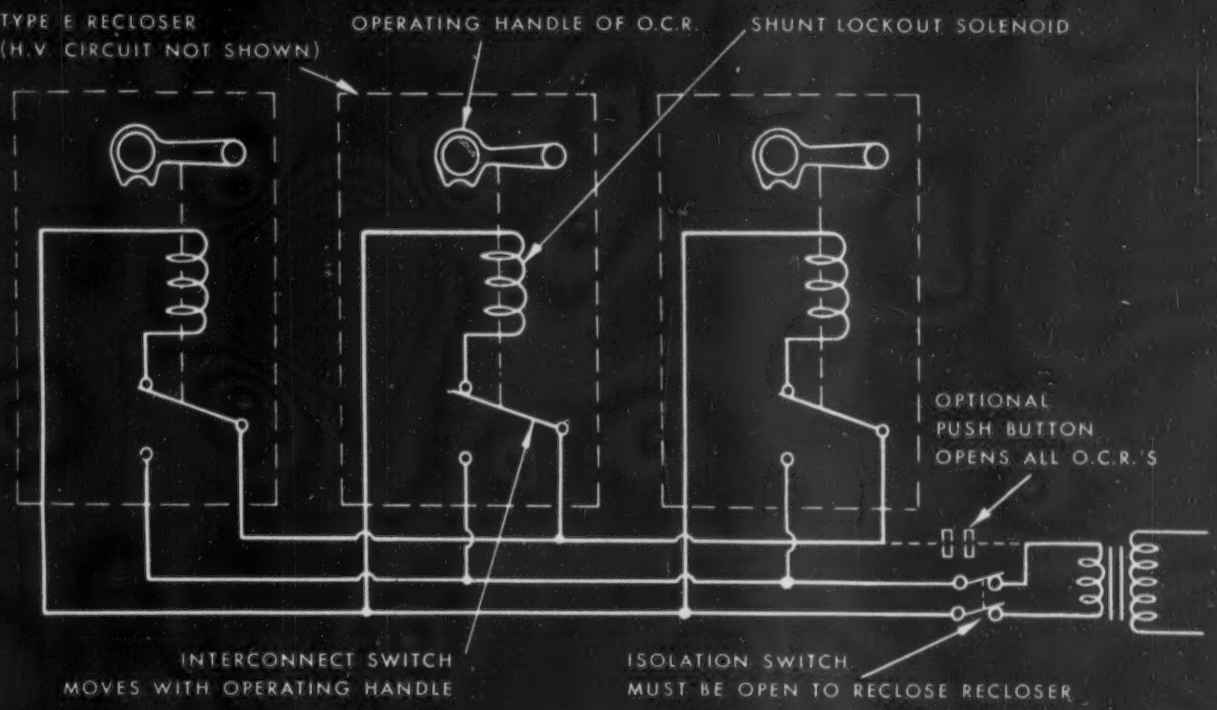
General Offices
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices
Coast to Coast

USS STEEL
UNITED STATES STEEL

UNITED STATES STEEL



Wiring diagram shows shunt lockout solenoids as applied to three Kyle Type E 23 kv reclosers. If any one phase locks out, the solenoids automatically lock out the other two phases.

Solenoid for Kyle® Type E Recloser Prevents Prolonged Single-Phasing

New shunt lockout solenoid is now available on Kyle Type E reclosers to prevent prolonged single-phasing of three-phase feeder. The Type E recloser coils are rated from 5 to 100 amperes at 23 kv with high interrupting capacities of 2500 amperes at 14.4 kv, 1750 amperes at 23 kv.

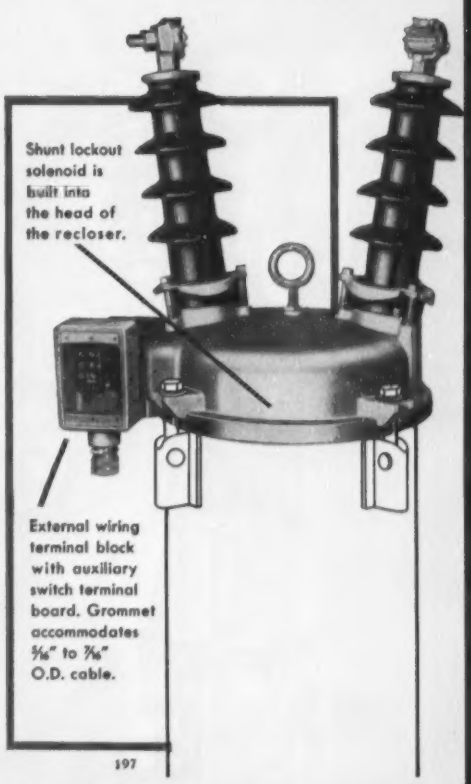
By W. C. Wiechmann
Application Engineer, Kyle Products Sales, Line Material Company

The shunt lockout solenoid, available on L-M's Kyle Type E recloser, is designed to trip the lockout latch and lock the recloser out. Electrical interconnection of the Type E recloser is made through the solenoid coils, thereby providing multi-phase lockout of the feeder. This multi-phase lockout will prevent a back-feed to a fault through the other phases —and eliminate prolonged single-phasing on three-phase equipment.

The shunt lockout solenoid is built into the head mechanism of the recloser. If any one phase locks out, the solenoid locks out the other two phases. The coil operates on 115 volt service and requires approximately 250 va per recloser. If an existing secondary is not available, a 1½ kva transformer is recommended. The device is an additional feature which is built in at the factory, on order.

The Kyle Type E is the only 23 kv recloser on the market. It has exceptionally strong construction and heavy insulation. The large contacts of finest arc-resisting material and the improved oil cross-blast method of arc extinction make the Type E an outstanding recloser for high-voltage application.

Get details on the Type E recloser and the multi-phase lockout, both of which have proved so successful in service. Ask the L-M Field Engineer for copy of bulletin on the Kyle Type E, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).


Shunt lockout solenoid is built into the head of the recloser.
External wiring terminal block with auxiliary switch terminal board. Grommet accommodates 5/16" to 7/16" O.D. cable.

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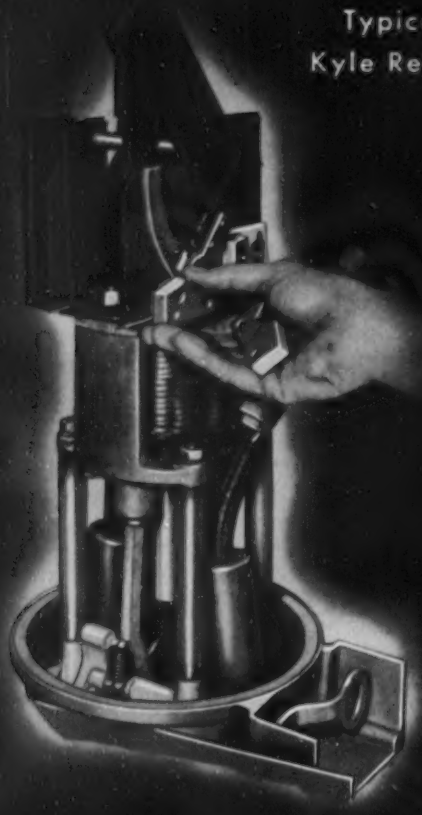
LINE MATERIAL Kyle® Reclosers

Typical Procedures for Kyle Recloser Maintenance



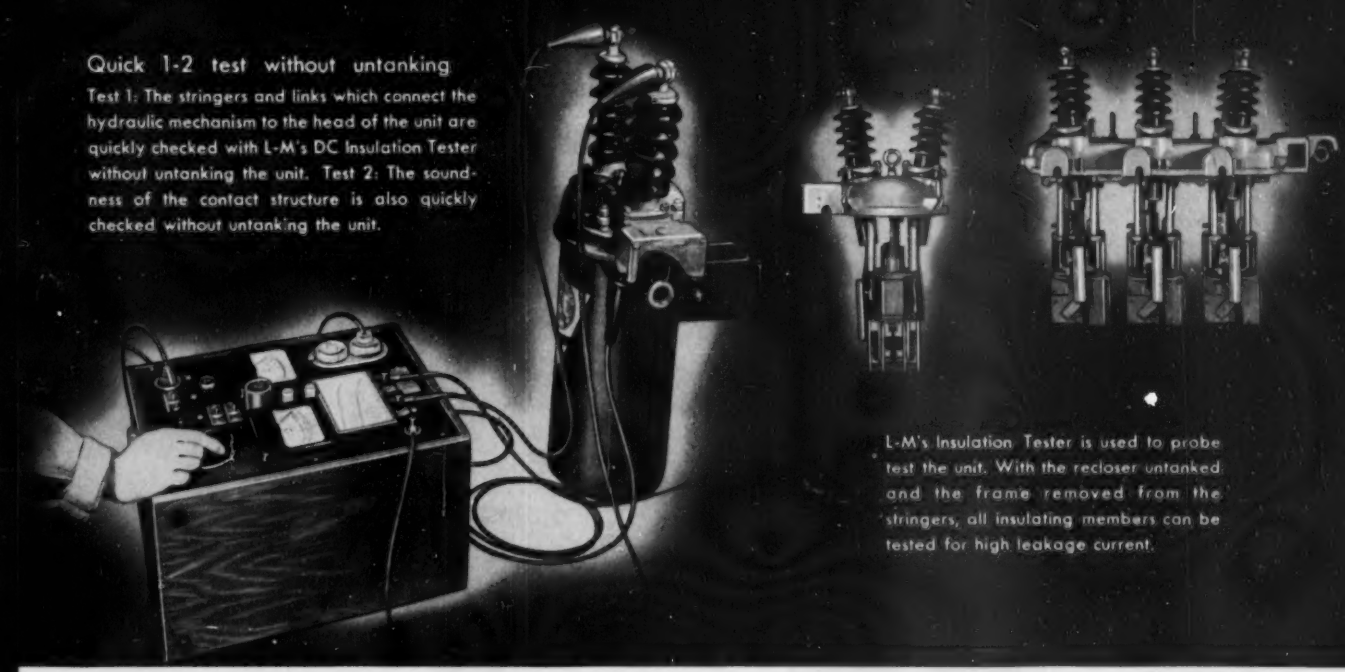
Check mechanism to see if contacts close freely, are smooth and free from carbon. L-M offers a complete contact assembly which is pre-adjusted at the factory and very easy to install.

If liner shows signs of moisture such as blisters, or softness at bottom, it is an indication that the recloser may need drying out. The liner should be replaced or dried out when there are signs of moisture.

Clean tank with new oil and thoroughly wipe out carbon deposit. Refill with oil that has been hi-pot tested, whether new or reclaimed. (New oil may have absorbed moisture if the drum was left open for any length of time.)

Clean mechanism, removing all carbon traces by wiping with clean, lint-free cloth, paying special attention to all insulating parts.

Before mechanism is replaced in tank, check and install a new head gasket, if necessary, to insure a good seal against moisture.



Quick 1-2 test without untanking

Test 1: The stringers and links which connect the hydraulic mechanism to the head of the unit are quickly checked with L-M's DC Insulation Tester without untanking the unit. Test 2: The soundness of the contact structure is also quickly checked without untanking the unit.

L-M's Insulation Tester is used to probe test the unit. With the recloser untanked and the frame removed from the stringers, all insulating members can be tested for high leakage current.

Take Advantage of Longest Practical Maintenance Cycle in Kyle® Reclosers

The maintenance cycle may be one, three, or more years, depending on climatic conditions and the duty imposed on the recloser. A method is given for determining frequency and simplifying maintenance.

by **R. C. KIRK**
Manager
Kyle Products Sales
Line Material Company

Many Kyle reclosers are still in operation after three, four, or more years without any maintenance. To assure dependable and continued operation, such reclosers should be checked. Kyle engineers recommend a program of spot checking reclosers, to determine the longest safe maintenance cycle for your operating conditions.

The length of time a recloser can be operated without maintenance depends on several factors. Collection of moisture, for example, is a result of time, loads, and climatic conditions. The collection of carbon is, of course, a result of the operating duty, i.e., the number of arc interruptions, magnitude of the current, voltage, and power factor of the fault current. These factors, involved in determining the recloser maintenance cycle, vary with each section of the country and with the operating duty imposed on the recloser. To obtain the longest practical maintenance cycle you should organize a program that meets your individual requirements.

One means of making a quick insulation check, without disassembling the recloser, is with L-M's new DC Insulation Tester. This is a highly efficient, low-priced portable unit that accurately determines the condition of insulation in reclosers and other apparatus.

If you find it necessary to replace the contacts on the recloser, it is advisable to replace the complete contact assembly, because this insures obtaining the proper setting of the contacts without calibration equipment. L-M makes available a complete contact assembly which is pre-adjusted at the factory and very easy to install. All the insulation parts as well as the contact assembly are shipped in a sealed plastic bag so that they will be protected from moisture in handling and storage.

Get The Facts On Maintenance

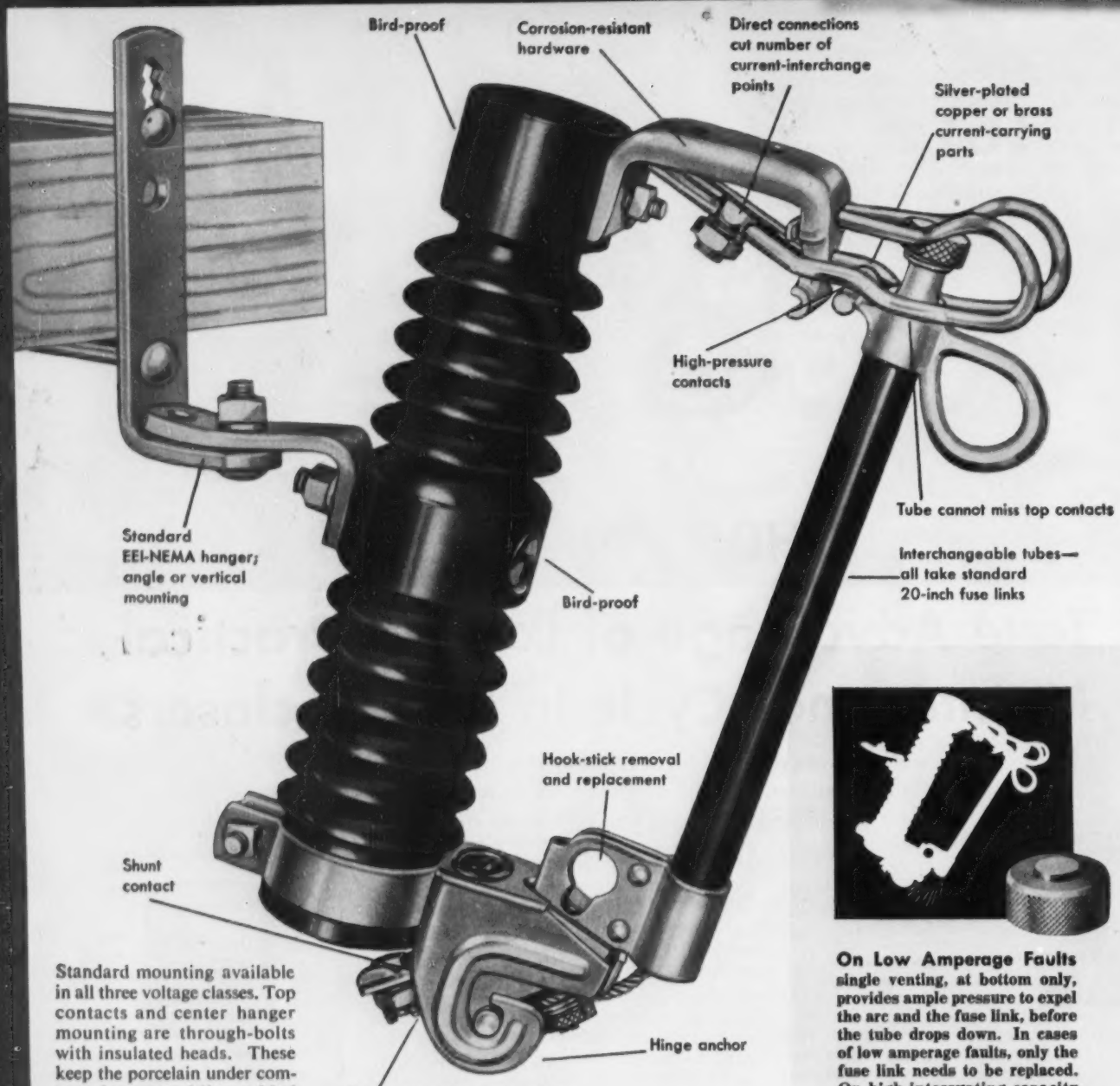
The L-M Field Engineer can help you with your maintenance problems. Discuss them with him—you'll find his advice helpful. Detailed maintenance instruction bulletins are available for Kyle reclosers, switches and sectionalizers. A bulletin that discusses factors determining the frequency of maintenance periods and how maintenance should be done is also available. Ask your L-M Field Engineer for these bulletins or write Kyle Products Division, Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Coils are vacuum-impregnated and shipped in oil-filled, sealed cans. L-M reclosers are so constructed that coils of different ampere ratings are interchangeable.

Other insulation parts as well as the contact assembly are shipped in sealed plastic bags to protect against moisture and dirt.

199

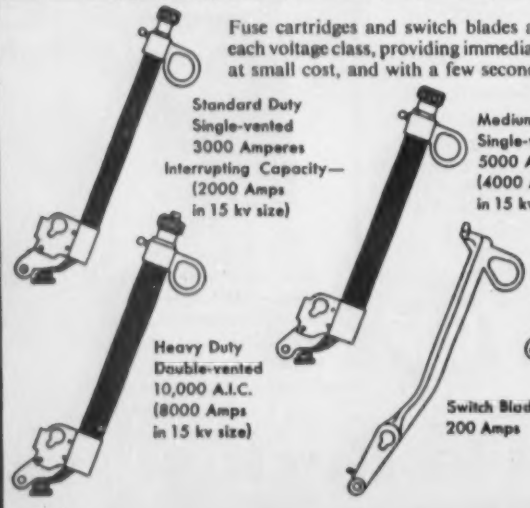
LINE MATERIAL Kyle® Reclosers


Bird-proof
Corrosion-resistant hardware
Direct connections cut number of current-interchange points
Silver-plated copper or brass current-carrying parts
High-pressure contacts
Tube cannot miss top contacts
Interchangeable tubes—all take standard 20-inch fuse links
Standard EEI-NEMA hanger; angle or vertical mounting
Bird-proof
Hook-stick removal and replacement
Shunt contact
Hinge anchor
Direct connections cut number of current-interchange points

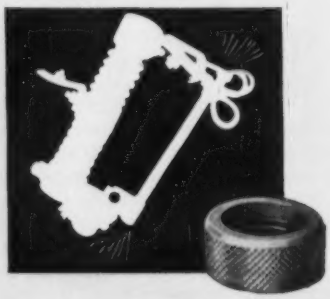
Standard mounting available in all three voltage classes. Top contacts and center hanger mounting are through-bolts with insulated heads. These keep the porcelain under compression, providing added strength and a completely bird-proof design.

On Low Amperage Faults single venting, at bottom only, provides ample pressure to expel the arc and the fuse link, before the tube drops down. In cases of low amperage faults, only the fuse link needs to be replaced. On high interrupting capacity cutouts, the expendable cap, above, right, remains intact, the same as the solid cap.

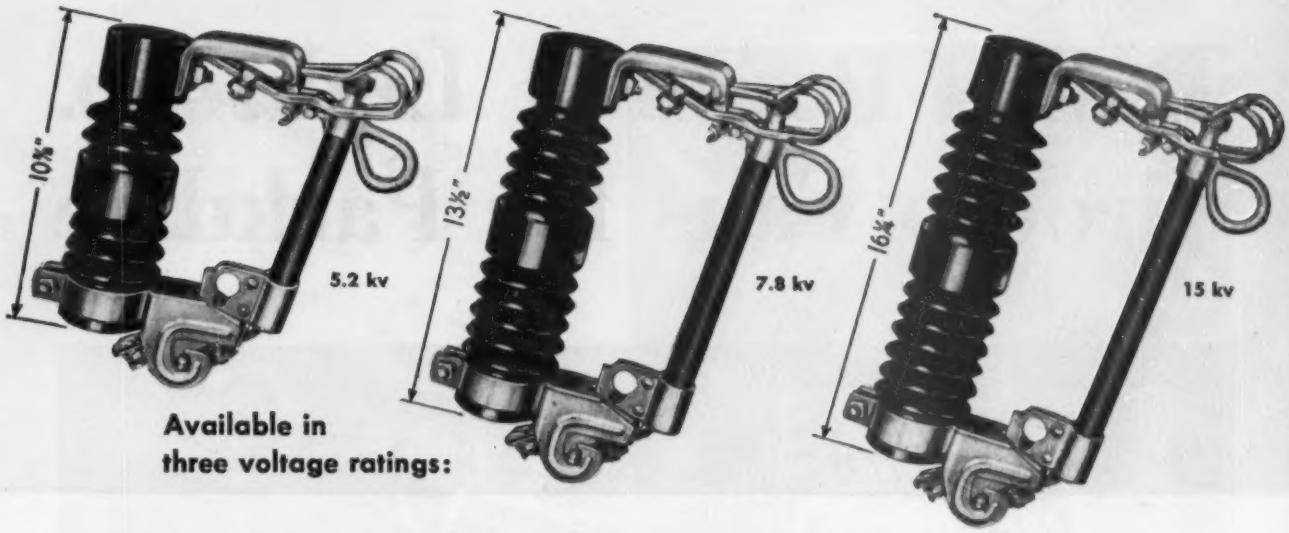
Fuse cartridges and switch blades are completely interchangeable in each voltage class, providing immediate increase in interrupting capacity at small cost, and with a few seconds work with a hook-stick.


Standard Duty Single-vented 3000 Amperes Interrupting Capacity— (2000 Amps in 15 kv size)
Medium Duty Single-vented 5000 A.I.C. (4000 Amps in 15 kv size)
Medium Duty Double-vented 6000 A.I.C. (4000 Amps in 15 kv size)
Heavy Duty Double-vented 10,000 A.I.C. (8000 Amps in 15 kv size)
Switch Blade 200 Amps

Interchangeable load-break cartridges will be available soon for each voltage class cutout. Easy pulling action will break link inside tube, and arc is cleared before tube can drop.



On High Amperage Faults pressure automatically opens the expendable cap at the top to provide double venting. No bursting of tubes. Gas flashover is eliminated because no cutout parts are in the path of gas discharge.



Available in three voltage ratings:

L-M's New "HDO" Open-Type Cutouts... The Cutout Development Of The Year!

New "HDO" 100-ampere cutouts are the simplest, most rugged, easiest to operate in the industry today. Provide high interrupting capacity, bird-proof design; heavy construction, assuring economy.

By **R. W. KELLY**
Application Engineer
Protective and Switching Equipment Division
Line Material Company

Here's a big new development in open-type cutouts that offers you a tremendous improvement in performance, operation, and economical long life.

The "HDO" is a big, rugged cutout. It is strong, durable. It's the easiest cutout to operate you ever saw. Complete hook-stick removal and replacement of cartridges. Bird-proof construction. Silvered current-carrying parts with few current-interchange points assure ample capacity without overheating. And it operates equally well on high and low fault currents.

Positive Pressure Control

A feature of the "HDO" is L-M's exclusive pressure-controlled expendable cap. On low faults the pressure is confined, assuring consistent, reliable arc interruption. On high faults the diaphragm in the cap opens, relieving the pressure by providing double venting.

Complete Line of Cutouts

Prices for the "HDO" cutouts are extremely reasonable, and the interchangeability feature offers desirable future economies. The complete line includes cutouts in the 5.2, 7.8, and 15 kv classes, with a full line of cartridges in standard- and heavy-duty interrupting ratings, and a 200-ampere switch blade. All cartridges take standard 20-inch distribution fuse links.

Protection That Is Reliable

The many desirable features incorporated in L-M's "HDO" open-type cutout assure positive action, dependable service.

Completely bird-proof construction.

Current-carrying parts all silver-plated brass or copper; this prevents false outages caused by contact heating even after many years of operation.

Cartridge firmly anchored for closing-in on faults; tube cannot move upward; cannot pop out of bottom hinges in closing.

All cartridges are designed for complete removal and replacement with a standard hook-stick.

Maximum interrupting capacities with any size link. Cutout interrupts any fault current from minimum melting of link to maximum cutout rating.

Connectors mounted directly on stationary contacts eliminate several current-interchange points.

Tube cannot miss top contacts, which are heavy silver-plated springs and designed to serve as a guide.

Corrosion-resistant, high-strength hardware has four to six times the life of mild steel.

Get Complete Information

Ask the LM Field Engineer for complete information about L-M's complete line of open and enclosed fuse cutouts and other protective equipment. Or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

SIZES AND RATINGS

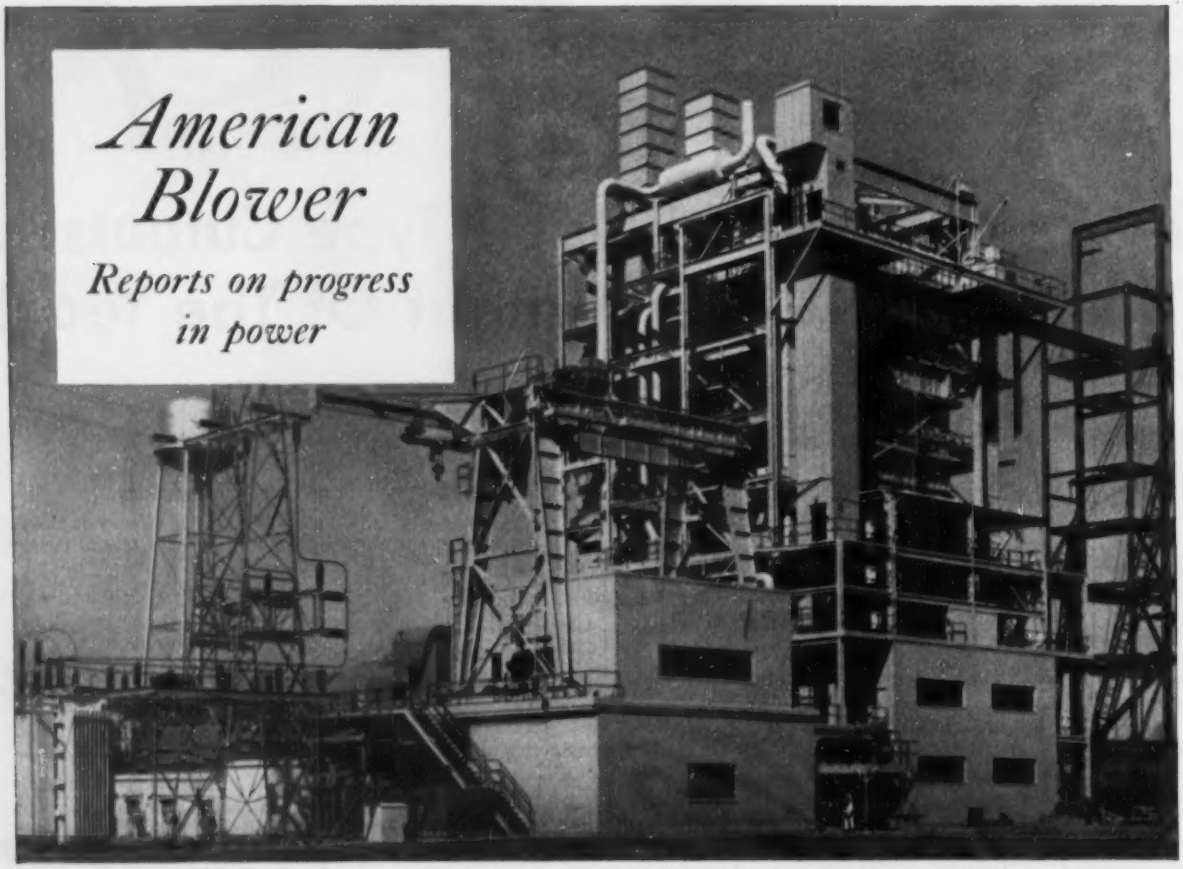
Cartridges	Interrupting Capacity, Amperes 5.2 kv.	7.8 kv	15 kv
Standard Duty Single Venting (Solid Cap)	3000 A.	3000 A.	2000 A.
Medium Duty Single Venting (Solid Cap)	5000	5000	4000
Medium Duty Double Venting (Expendable Cap)	6000	6000	4000
Heavy Duty Double Venting (Expendable Cap)	10,000	10,000	8000
Switch Blade	200 amperes continuous		

All cartridges and switch blades interchangeable in each voltage class.

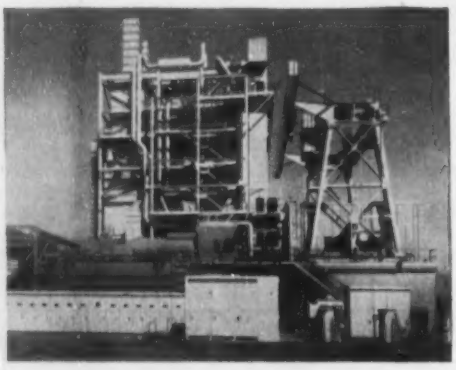
LINE MATERIAL
fuse cutouts and fuse links

204

Dallas Power & Light Co. Sirocco Fans for Parkdale



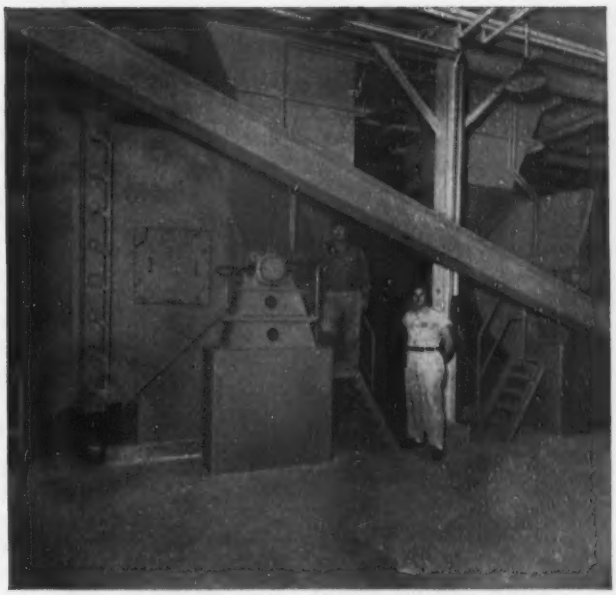
DP&L's No. 1 unit at Parkdale Plant has 87,000 kw generating capacity. The No. 2 unit, now under construction (far right) will add an additional 115,000 kw of capacity.



DP&L expansion program will increase capacity 48 per cent in two years

Two 115,000 kilowatt generating units under construction at Dallas Power & Light Company plants would have served all of metropolitan Dallas' electrical needs as late as 1949. One of the two new units is shown at left at Parkdale Plant, and the other is being built at DP&L's Mountain Creek Plant. Together, the new generators will increase the company's capability 48 per cent by the end of 1956. They will help meet peak demands on DP&L's system which have risen at an average rate of 17 per cent each year since 1946.

chooses Plant



Two American Blower Forced Draft Fans are in operation at the Parkdale Plant. Capacity of each is 123,500 cfm at 100° F at 29" sp. Each fan is driven by an 800-hp motor.

PARKDALE PLANT, newest of Dallas Power & Light Company's generating stations, is the Company's first station to use a pressure furnace. For its initial unit and for Unit No. 2, which is scheduled for completion early in 1955, Dallas Power & Light Company selected American Blower Sirocco Forced Draft Fans.

American Blower Sirocco Fans have long been favorites with progressive power plant operators throughout the United States and Canada. And for good reasons! Sirocco Fans are extremely quiet in operation; they are dependable; and they are economical to run.

In addition to Mechanical Draft Fans for both forced and induced draft, American Blower manufactures Fly Ash Precipitators, Heavy-duty Steam Coils and Gyrol Fluid Drives, for smooth adjustable speed control of fans and boiler feed pumps.

If you have an air handling problem, or plan to expand or modernize your facilities, let American Blower's wide experience work for you. Contact your nearest American Blower Branch Office or write us direct.

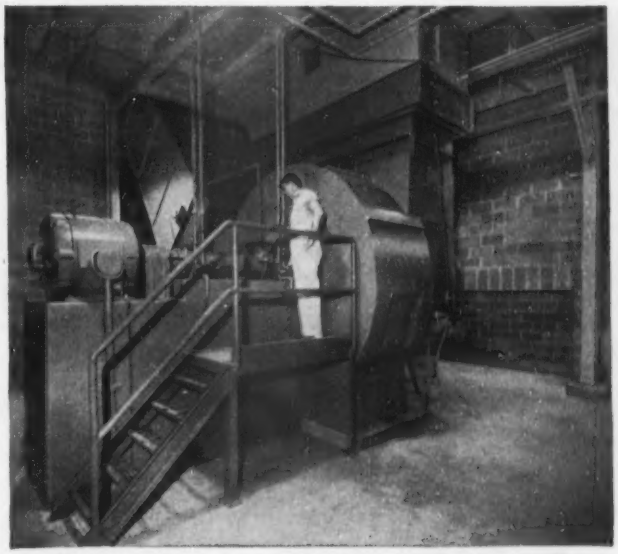


Photo shows an American Blower Recirculating Gas Fan in operation at the Parkdale Plant. Driven by a 100-hp motor, it is rated at 54,000 cfm at 775° F at 6.6" sp.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

International leads again!

With 4 Great New *All-Truck* Features for America's Only *All-Truck* Light-Duty Models

INTERNATIONAL—world famous for truck value and *all-truck* engineering—now brings four big quality advancements to the light-duty field! Now—with new engines, new handling ease and performance—INTERNATIONAL sets a new high in light-duty truck value! See these newest features at your INTERNATIONAL Dealer or Branch—see how much more an *all-truck* INTERNATIONAL provides!

1 New Tubeless Tires

Now standard equipment on all ONE HUNDRED Series models! Provide great new *safety* and freedom from tire troubles. Lessen the danger of blowouts and punctures. Operate with less noise.

2 New Automatic Transmission

The last word in automatic drives! Provides extra pulling power for smooth, fast starts under load—offers direct gear drive in high for economy equal to conventional transmission. Saves driver energy. Reduces engine, drive-line and tire wear. Cuts maintenance expense. Available for all light-duty models, at extra cost.

3 New Overdrive Transmission

INTERNATIONAL-tested, INTERNATIONAL-proved to provide outstanding light-duty truck economy. Reduces engine speed—increases engine life—saves on gasoline, oil and maintenance expense. Well worth the low extra cost in all ONE HUNDRED and R-110 Series models.

4 New Power Steering

Truck-designed, truck-built to combine finger-tip-easy parking and maneuvering with true, solid "feel of the wheel." Safety-engineered to provide conventional steering in event of power failure. A low-cost optional extra, available on all light-duty models.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

Service-Utility bodies. 77, 89 and 96-inch body lengths for 115, 127 and 134-inch wheelbase chassis respectively. GVW ratings, 4,200 to 8,600 lbs.

International Harvester Builds **McCORMICK®** Farm Equipment and **FARMALL®** Tractors...Motor Trucks...Industrial Power...Refrigerators and Freezers

See the season's new TV hit, "The Halls of Ivy," with the Ronald Colmans, Tuesdays, CBS-TV, 8:30 p.m., EST

INTERNATIONAL® TRUCKS

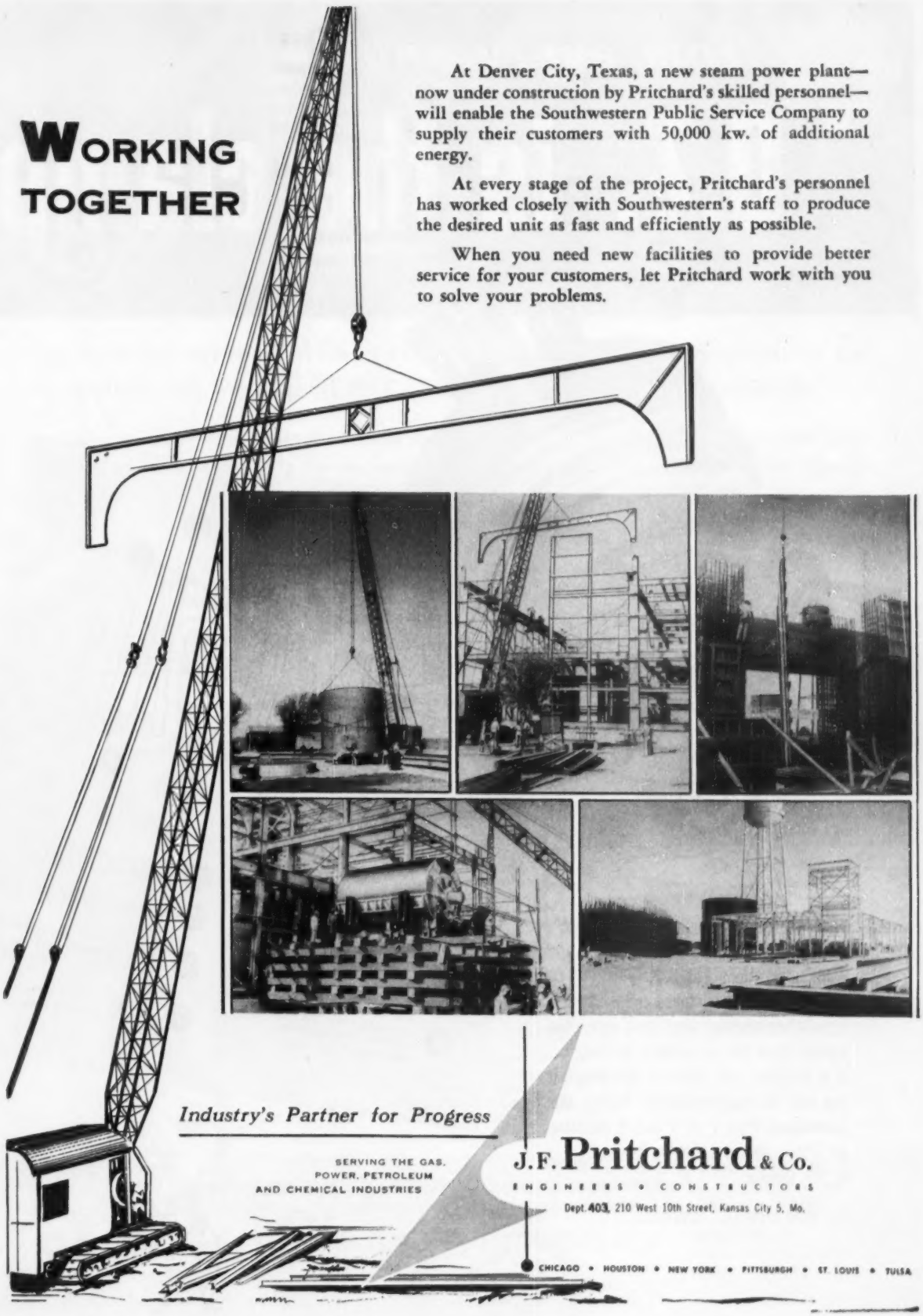
"Standard of the Highway"

WORKING TOGETHER

At Denver City, Texas, a new steam power plant—now under construction by Pritchard's skilled personnel—will enable the Southwestern Public Service Company to supply their customers with 50,000 kw. of additional energy.

At every stage of the project, Pritchard's personnel has worked closely with Southwestern's staff to produce the desired unit as fast and efficiently as possible.

When you need new facilities to provide better service for your customers, let Pritchard work with you to solve your problems.



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SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES

J.F. Pritchard & Co.

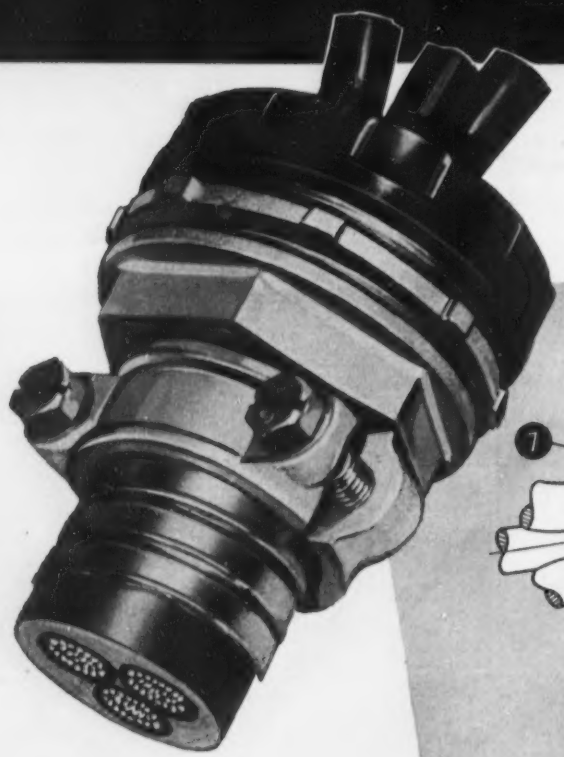
ENGINEERS • CONSTRUCTORS

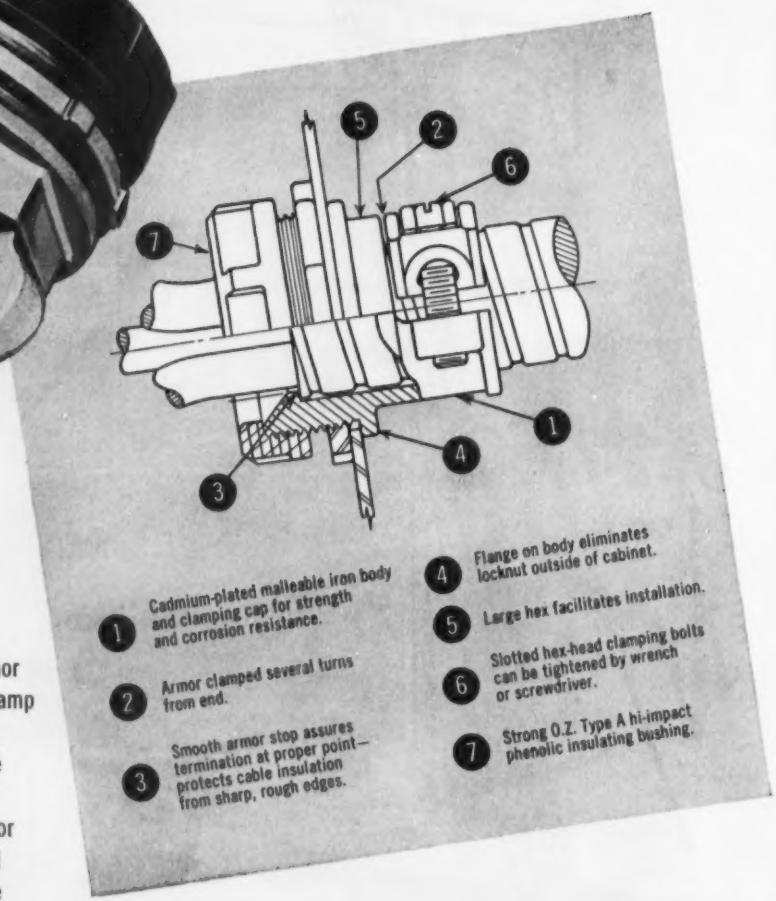
Dept. 403, 210 West 10th Street, Kansas City 5, Mo.

CHICAGO • HOUSTON • NEW YORK • PITTSBURGH • ST. LOUIS • TULSA

from every angle–

O.Z. TYPE "PK" is the clamp




5
2
6
7
1
4
3
1 Cadmium-plated malleable iron body and clamping cap for strength and corrosion resistance.
2 Armor clamped several turns from end.
3 Smooth armor stop assures termination at proper point—protects cable insulation from sharp, rough edges.
4 Flange on body eliminates locknut outside of cabinet.
5 Large hex facilitates installation.
6 Slotted hex-head clamping bolts can be tightened by wrench or screwdriver.
7 Strong O.Z. Type A hi-impact phenolic insulating bushing.

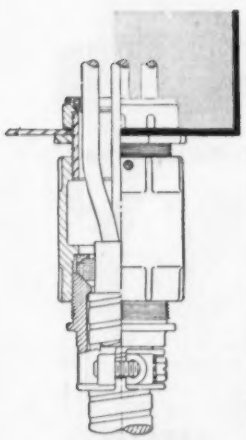
Here is a clamp designed specifically to meet the requirements of interlocked armor cable applications. The O.Z. Type "PK" Clamp provides exceptional speed and ease of installation, whether your cable enters the cabinet from the top, bottom or side. It is designed with ample thread length for use with all standard conduit fittings and terminators from 1" to 5" and is available for interlocked armor cable ranging in size from .99" to 4.38" O.D.

Call your local O.Z. Distributor.

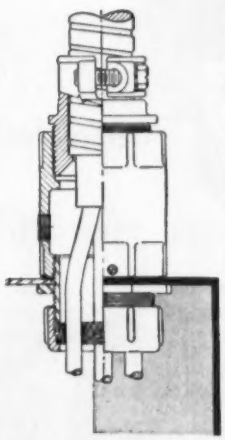
for ARMORED CABLE

combines with standard O.Z. fittings for any terminating or splicing job involving INTERLOCKED ARMOR CABLE.

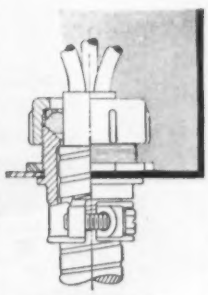
Seals cable ends to protect insulation against moisture and other contaminators—can also be used with threaded hubs and bosses to provide watertight cable entrances.



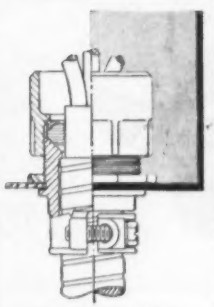
TYPE "PKC"
Terminator for interlocked armor cable entering bottom of cabinet.



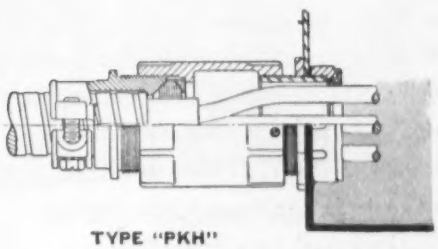
TYPE "PKT"
Terminator for interlocked armor cable entering top of cabinet.



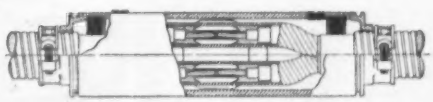
TYPE "PKG"
Sealing bushing for interlocked armor cable entering a cabinet.



TYPE "PKF"
Compound bushing for interlocked armor cable entering bottom of cabinet.



TYPE "PKH"
Terminator for interlocked armor cable entering side of cabinet.



TYPE "PKS-J"
Splicing chamber for interlocked armor cable.

O.Z. ELECTRICAL MANUFACTURING CO., INC.
262 BOND STREET • BROOKLYN 17, N. Y.

CAST IRON BOXES
CABLE TERMINATORS
POWER CONNECTORS
SOLDERLESS CONNECTORS
GROUNDING DEVICES
CONDUIT FITTINGS

$ensible $aving

is the smart reason for the 20 ft. length of these rolls. You get this size in the 10-roll container of *Gold Seal* Plastic Tape. For companies that supply tape to many workers for varied jobs, it's the best buy. "Tape-saver" size, we call it. It's enough for the average job . . . footage of "lost" tape is kept low. Workers like the small size, too. It "swings" easy in tight places. And remember, you start saving the minute you say

GOLD SEAL
plastic tape

It gives you the many plastic tape advantages, with the plus of proved Gold Seal quality. With the warranty of Jenkins Tape specialists, you can be sure it will speed the job, stick right, and stand up under toughest conditions. Try it . . . sample free on request. Jenkins Bros., Rubber Division, 100 Park Ave., New York 17.

Gold Seal Plastic Tape — single 60 ft. rolls in round metal cans and Handy Pack of ten 20 ft. rolls.

JENKINS

Gold Seal Tape

FRICTION • RUBBER • PLASTIC

Single rolls and 10-roll containers. Also Diamond Seal Friction and Rubber Tapes made to ASTM Specifications. Products of Jenkins Bros. — makers of famous Jenkins Valves.

EC&M Heavy-duty Motor Starters* *Pay Off* on essential drives

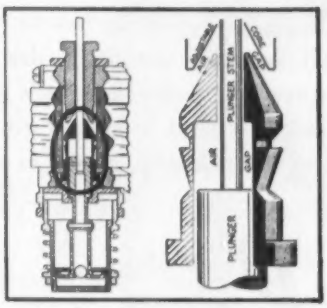
FLOOR MOUNTED **WALL MOUNTED**

You Save MORE when you give Plant Management Continuity of Service

For pumps, compressors, conveyors and similar drives essential to a plant's over-all production, keep in mind the qualities of EC&M Motor Starters that help speed output.

EC&M's magnetic Overload Relays give dual protection. They trip *instantly* on heavy overloads and provide inverse time-element trip to safeguard motors under all conditions. A magnetic balance absorbs starting currents and permits a low current-setting for running protection. These relays use silicone dashpot fluid.

Combined with EC&M's well-known *LINE-ARC* Contactor to open and close the motor circuit, these starters are unequalled for industry's important drives.



Special Iron Sleeve with tapered wall thickness provides non-creeping relay permitting low current-setting.

***For low voltage---550 volts or less.**

For COMPLETE FACTS, ask for Bulletins 1067 and 1180-2.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

Add invisible cops to your police force!

Light and lots of it is the very best deterrent there is to crimes of violence. That is why it is so terribly important that residential streets, as well as boulevards and shopping areas, be adequately and dependably lighted.

Dependable lighting has to be more than good looking, scientifically designed lighting fixtures. The power cables are part of it too. Such cables must be able to withstand winter thaws and freeze-up, as well as summer rains. They must also withstand high summer heat and winter cold.

ANHYDREX Series Street Lighting Cables do this and more. They can be buried in the ground or pulled through ducts. Sometimes they are used inside the lighting standard. But regardless of how they are used, they are dependable. They require no lead sheaths or metallic armor.

Want to know more about these versatile street lighting cables that can be used overhead or underground with or without ducts? Write us directly or contact our representative in your area for more detailed information.

Simplex–ANHYDREX
Series Street Lighting Cables

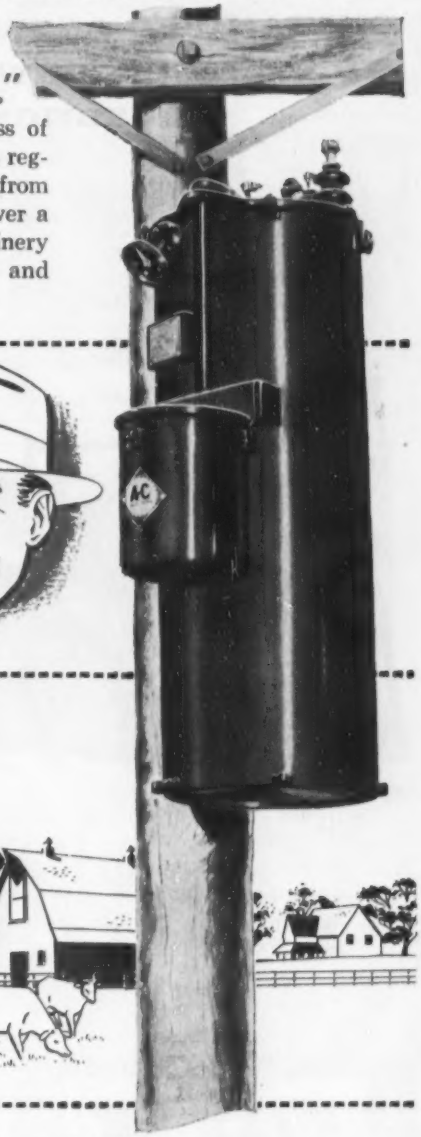
SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Here's What System Operators Say About

Allis-Chalmers DISTRIBUTION REGULATORS...

"We increased revenue — and profits."

Because they maintain correct voltage regardless of cause of voltage drop, Allis-Chalmers distribution regulators assure system operators maximum profits from increased loads. Their narrow ± 1 volt band over a 20% range means that new appliances and machinery provide maximum service to the consumer — and maximum profits to the system.



"We eliminated voltage complaints."

Adding load may actually mean adding maintenance crews and equipment unless you assure proper voltage levels. Allis-Chalmers distribution regulators provide an exceptionally flexible solution to voltage problems — they can be used again and again — even after feeders have been rebuilt — because they are so easy and so economical to reinstall.

"We get practically trouble-free service."

Ten years of operating experience has proved the economy and reliability of Allis-Chalmers distribution regulators. The first installation was on a Wisconsin rural system. Field operation has borne out the results of laboratory tests which showed that these rugged units can withstand millions of operations, equivalent to decades of service with little or no maintenance.

● Get all the facts on how Allis-Chalmers distribution regulators can increase revenue and profits, can improve customer satisfaction, and can eliminate problems caused by incorrect voltage. Call your nearest Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

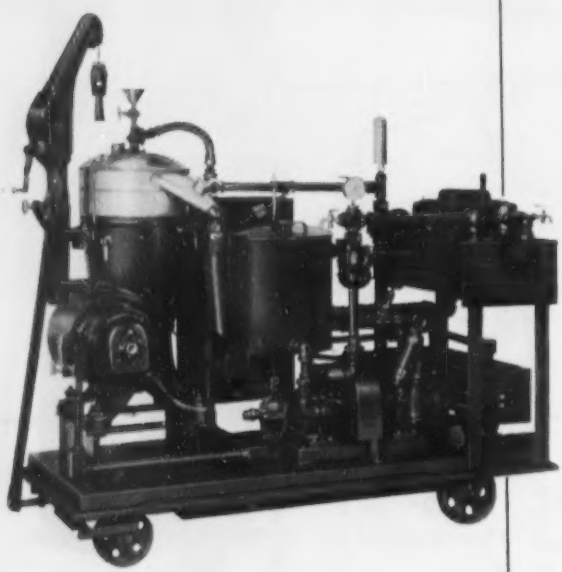
A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A-4519

GUARANTEED ANSWER TO EVERY OIL DRYING QUESTION...

DE LAVAL



With a De Laval Insulating Oil Purifier on the job, everybody knows there's no question about the dryness of the transformer or circuit breaker oil.

Every De Laval is *guaranteed* to reduce the free water content of new oil from an initial 1/10 of 1% to 1/1000 of 1%.

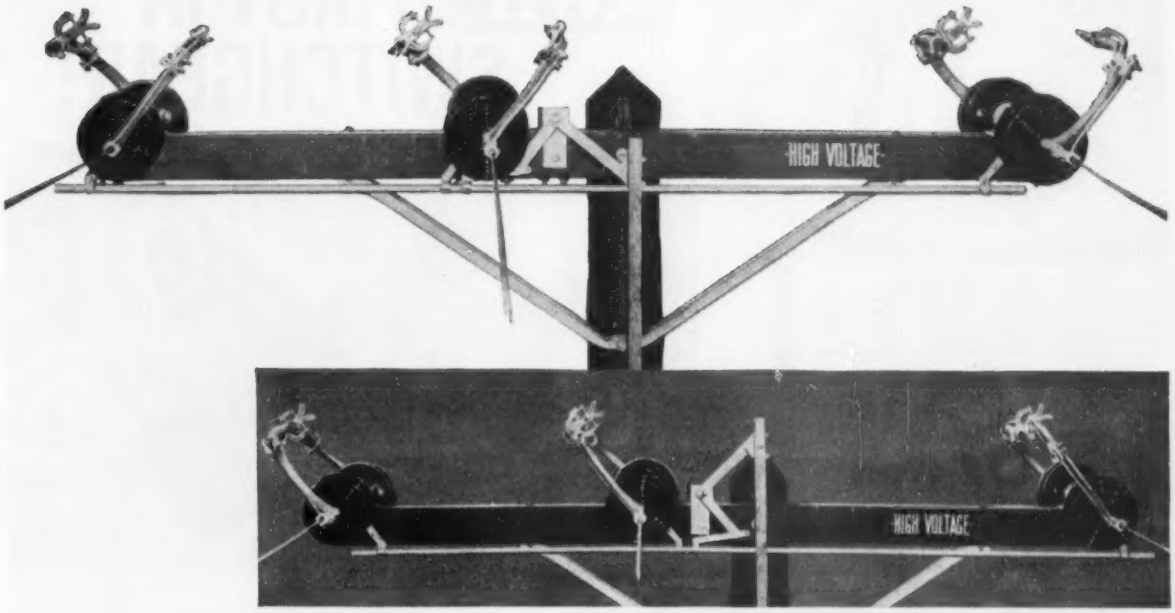
Furthermore, the De Laval Insulating Oil Purifier does its work with a *single* pass—and does it at safe, low temperatures.

Want to know more? Write for Bulletin TR-1.

DE LAVAL

insulating oil purifiers

THE DE LAVAL SEPARATOR COMPANY Poughkeepsie, New York • 427 Randolph St., Chicago 6 • DE LAVAL PACIFIC CO. 61 Beale St., San Francisco 5



Note clean, neat pole top appearance of KPF switches open (top picture) and closed. Appearance is marked contrast with usual clutter of mechanism.

Simple design and sturdy construction insure years of trouble-free switching

KPF Air Break Switches look different because they *are* different. They are the simplest air break switches made. They consist of two rigid dead-end insulator assemblies with rigid jumpers forming the switch arms. One assembly is mounted stationary to the cross-arm. The other rotates to make and break the circuit. There are no complex parts to get out of order, require lubrication, adjustment or other service. Sturdy KPF switches serve indefinitely.

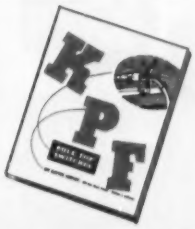
Simple design also means simpler manufacturing and lower cost. No separate dead-ends or extra insulators are required.

Finally, installation normally requires less than half the normal time. Phase units are shipped ready for use and need only be bolted to the cross-arm.

KPF Air Break Switches have been used for almost 50 years on lines ranging from 7.5 to 110 kv. Tens of thousands are in use today by Pacific Gas & Electric, Southern California Edison, Minnesota Power & Light and other leading power companies.

For the world's simplest, surest, lowest cost air break switch, specify KPF Air Break Switches—standard for nearly 50 years.

New catalog gives complete specifications, detail drawings, installation information.

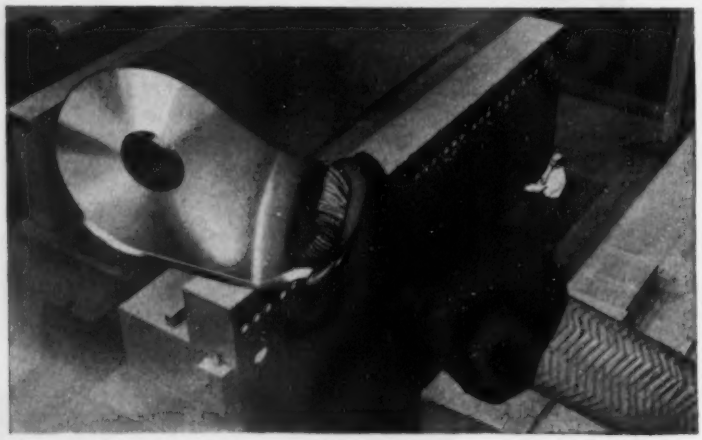


KPF ELECTRIC COMPANY
1624 East Alpine Avenue, Dept. E, Stockton 5, California

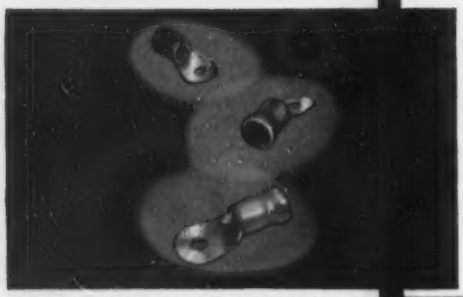
KPF
AIR BREAK SWITCHES
Standard for nearly half a century

A-MP FIRST IN SWITCHGEAR!

NEW DYNA-CRIMP TOOL
New, powerful, DYNA-CRIMP tool features fast positive crimping action and easily-opened swivel head. Crimping heads can be changed easily. A-MP DYNA-CRIMP tool gives maximum portability with remote control operation. Interchangeable dies are available for use with A-MP's complete line of Aluminum and Flag terminals. Shown above with moveable cart to transport power unit providing maximum flexibility for Bench-Production line use.



BONDING FEATURE MOST IMPORTANT
Bonded insulation is the most important factor *in producing a successful insulated terminal.* The positive and complete bond of the insulation to the terminal sleeve insures uniform insulation thickness under crimping pressures, and therefore transmits this pressure evenly to the center of the crimp area. With this precision-engineered A-MP crimp and BONDED insulation you can be sure of maintaining proper dielectric and tensile values in the finished connection. More intimate contact achieved by confining, over a greater area, terminal and wire under intense crimping pressure.



OTHER IMPORTANT A-MP "FIRSTS"
Completely separate metallic reinforcing ring grips wire insulation, prevents exposure of conductor during sharp bends, cable fatigue caused by flexing and vibration and forms a barrier to foreign objects coming in contact with current carrying members. New helical tongue design gives maximum strength with minimum weight.

Find out about the new AMP "CREATIVE APPROACH TO BETTER WIRING"

An evaluation survey without cost or obligation.

SIZES 8 THROUGH 4/0

Ampli-Bond
Trade-Mark

THE ONLY LARGE SIZE TERMINAL WITH BONDED INSULATION!

WITH INSULATION SUPPORT AND SUPERIOR A-MP CONFINED CRIMP.

10 distinctive and distinguishable features make precision-engineered AMPLI-BOND terminals the best quality insulated termination for copper wire.

- INSULATION WITHSTANDS A MINIMUM OF 6000 VOLTS!
- INNER COPPER SLEEVE FOR STRENGTH AND VIBRATION RESISTANCE
- FULLY INSULATED METALLIC REINFORCING RING GRIPS INSULATION
- COLOR CODED FOR RAPID IDENTIFICATION
- BRAZED BARREL SEAM
- SUPERIOR A-MP CONFINED CRIMP
- INNER BARREL DIMPLED FOR INCREASED TENSILE STRENGTH
- COPPER TERMINAL BODY ELECTRO-TINNED FOR HIGH CONDUCTIVITY
- BONDED INSULATION
- PROOFMARK FOR POSITIVE IDENTIFICATION

Here is a large size terminal that presents to the users of heavy duty wire the same quality connection that has made A-MP famous for PRE-INSULATED type terminals throughout the industry. Write today for information about AMPLI-BOND and new powerful AMP DYNA-CRIMP portable pneumatic-hydraulic crimping tool.

AMP Trade-Mark Reg. U.S. Pat. Off. — © AMP

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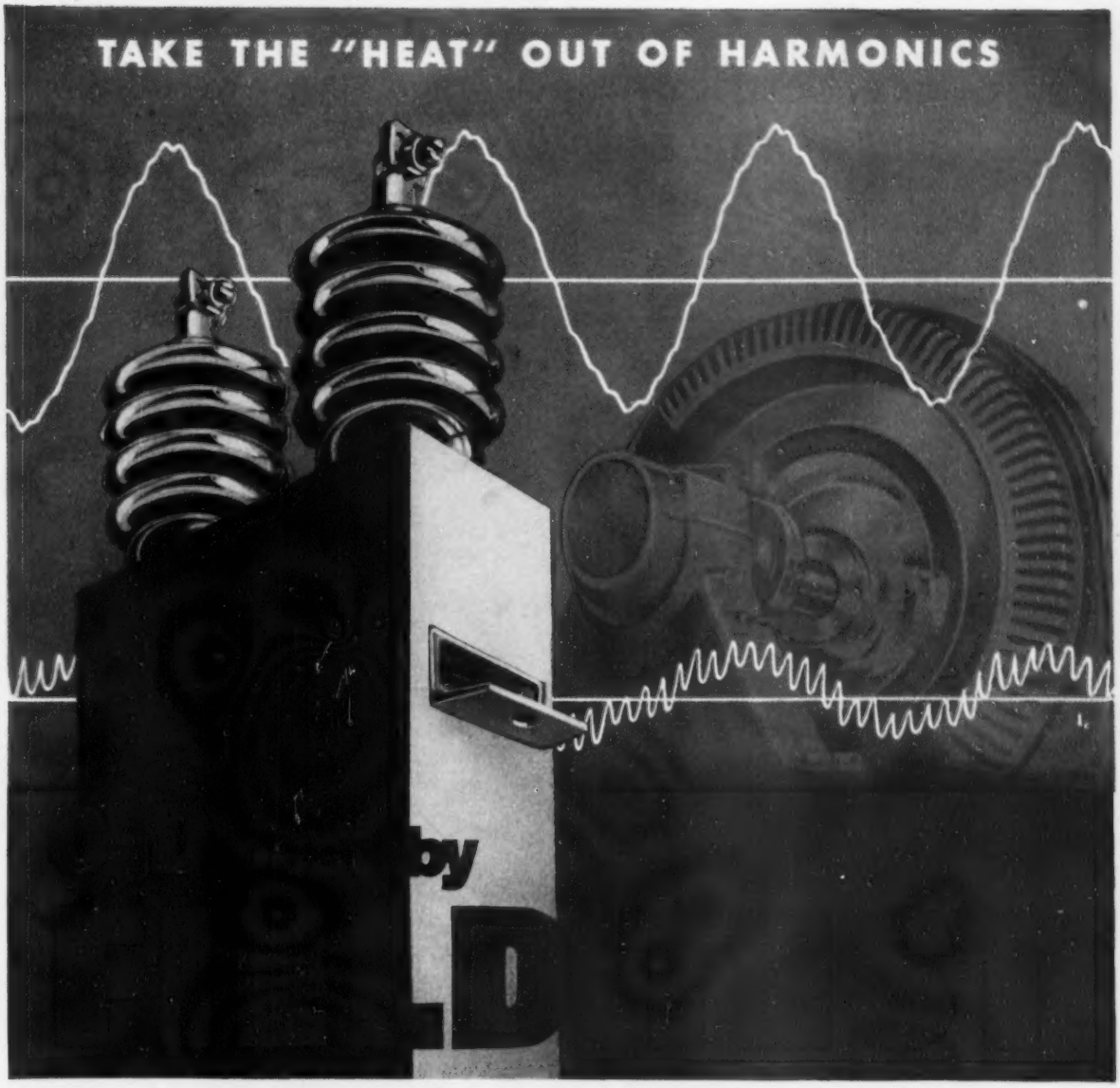
2100 Paxton Street, Harrisburg, Pennsylvania
In Canada . . . . Aircraft-Marine Products of Canada, Ltd.
1764 Avenue Road, Toronto 12, Ontario, Canada

TAKE THE "HEAT" OUT OF HARMONICS



e-wave form of voltage generated by an open slot type alternator of small kilovolt-ampere capacity.

I_c-capacitor current. The seventeenth harmonic in the voltage variation produces a pronounced seventeenth harmonic in the Ic variation.

There are more C-D capacitors in use today than any other make

C-D capacitors are especially designed to withstand the recognized damaging effects of high harmonic component currents associated with many of the earlier type alternators.

Again, C-D's built-in margin of safety permits the highest degree of trouble-free service under the most severe operating conditions.

We'll be glad to have one of our field engineers graphically demonstrate the dollar-saving economy utilities have enjoyed with their C-D capacitor installations. And why only C-D pre-delivery quality tests all power-factor capacitors at full rated voltage. Cornell-Dubilier Electric Corp., Dpt. D-124, South Plainfield, New Jersey.

CONSISTENTLY DEPENDABLE

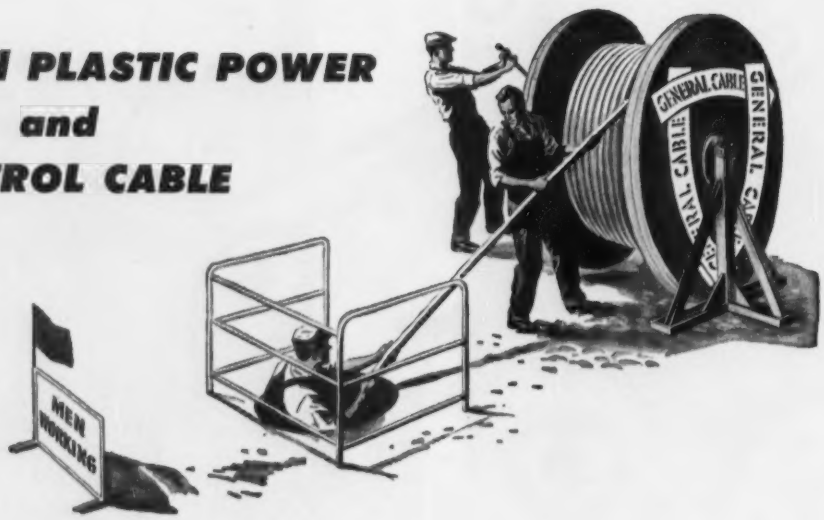
CORNELL-DUBILIER CAPACITORS

FOR POWER-FACTOR IMPROVEMENT

PLANTS IN SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY: THE RADIART CORPORATION, CLEVELAND, O.

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

RUBBER and PLASTIC POWER and CONTROL CABLE



Besides offering the most complete line, General Cable makes top notch engineering service and useful product information easily available.

Rubber and Plastic Power and Control Cables are designed for power transmission, distribution and control...for duct and conduit installation...for direct earth burial...for submarine and aerial use (self supporting types are available).

Rubber or GENCORONE (corona resistant) oil base compound or plastic insulated...with braided, leaded, interlocked or submarine armored finish.

These popular and versatile lines of products are made to meet practically every operating condition. Get the full facts before you buy. Let our engineers help solve your wire and cable problems.

Every type for every use!

BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

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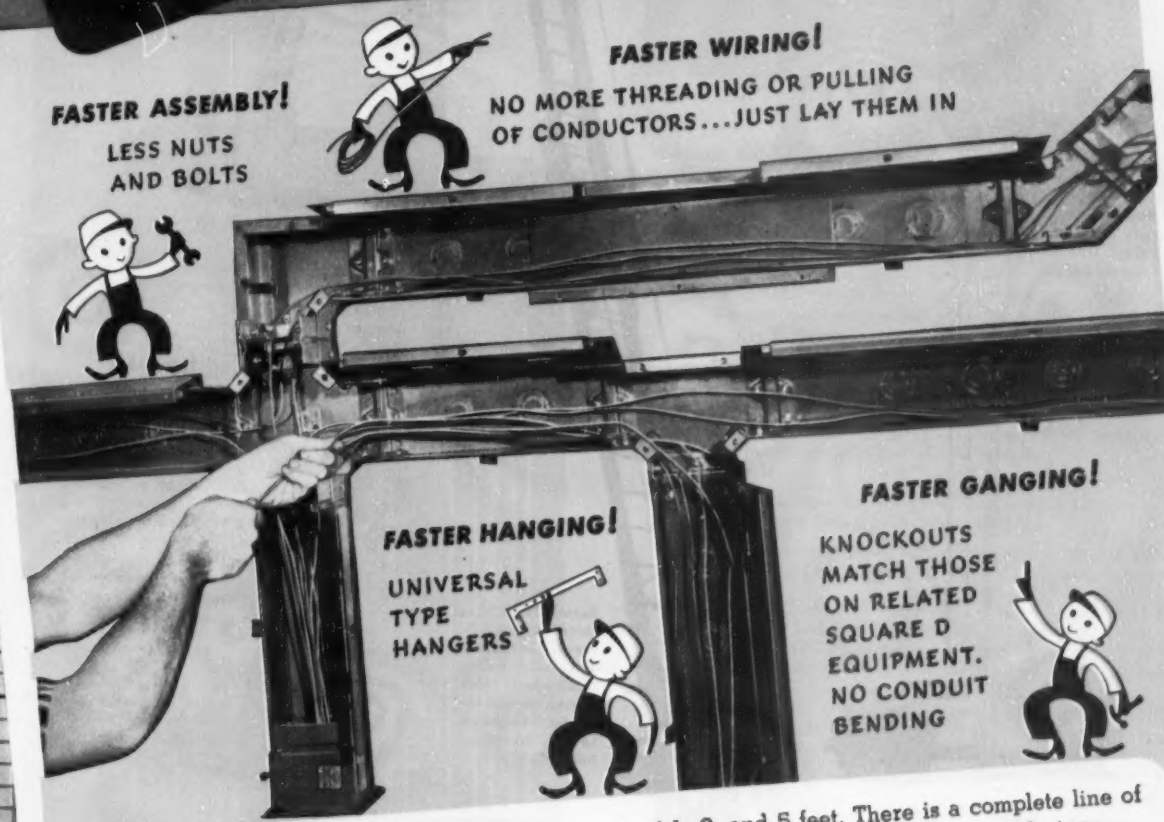
420 Lexington Avenue, New York 17, N. Y. • Sales Offices: Atlanta • Boston Buffalo • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Erie (Pa.) Greensboro (N. C.) • Houston • Indianapolis • Kansas City • Los Angeles Memphis • Milwaukee • Minneapolis • New York • Newark (N. J.) • Philadelphia Pittsburgh • Portland (Ore.) • Richmond (Va.) • Rochester (N. Y.) • Rome (N. Y.) St. Louis • San Francisco • Seattle • Syracuse • Tulsa • Washington, D. C.

GP-42A

INSTALL WIREWAYS FASTER!

SQUARE D's NEW AND EXCLUSIVE *Lay-in Duct*


FASTER ASSEMBLY!
LESS NUTS AND BOLTS
FASTER WIRING!
NO MORE THREADING OR PULLING OF CONDUCTORS...JUST LAY THEM IN
FASTER HANGING!
UNIVERSAL TYPE HANGERS
FASTER GANGING!
KNOCKOUTS MATCH THOSE ON RELATED SQUARE D EQUIPMENT. NO CONDUIT BENDING

Square D's exclusive design provides hinged covers for both the duct sections and connectors. Easily removable fitting covers then provide a completely unobstructed wireway in which to lay wires.

LAY-IN DUCT is available in 2½" x 2½", 4" x 4", and 6" x 6" sizes, in standard lengths of 1, 2, and 5 feet. There is a complete line of fittings, all with the "lay-in" design feature.

• • •

Write for the complete story of **LAY-IN DUCT**—how it gives you a better wireway system, easier, faster and at less cost. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

POWERS American AERIAL EQUIPMENT

AERIAL TOWERS

Series 7A-01 . . . in sizes for safe, smooth elevation to 21′ or 25′. Equipped with telescopic ladder. Operation from cab or tower. Platform revolves 360°.

HYDRAULIC AERIAL TOWERS

Series TW-2 . . . enables workmen to reach areas more than 35′ above ground. Can be operated from tower or truck cab. Platform revolves full 360°. Telescopic ladder is standard equipment.

REVOLVING Fully-Powered HYDRAULIC AERIAL LADDERS

Series HL-35 . . . elevates, extends, lowers, and retracts by *hydraulic power*. Available in sizes having ground-to-platform height up to 35′. Revolves full 360°.

REVOLVING AERIAL LADDERS

Series 5510 . . . perfectly balanced to permit fast, easy elevation. In sizes having 23′6″, 26′6″, and 30′6″ ground-to-platform height. Can be spotted at angles from 30° to 75°, and revolved full 360°.

HINGED LADDER RACK ASSEMBLIES

Standard and special racks, with extension ladders, can be furnished for installation on Powers-American bodies. These include racks with standard 24′ ladders, and racks with braced or trussed ladders to reach heights up to 30′.

A descriptive bulletin is available on each item of aerial equipment in the Powers-American line. Bulletins, plus prices and complete details, are yours for the asking.

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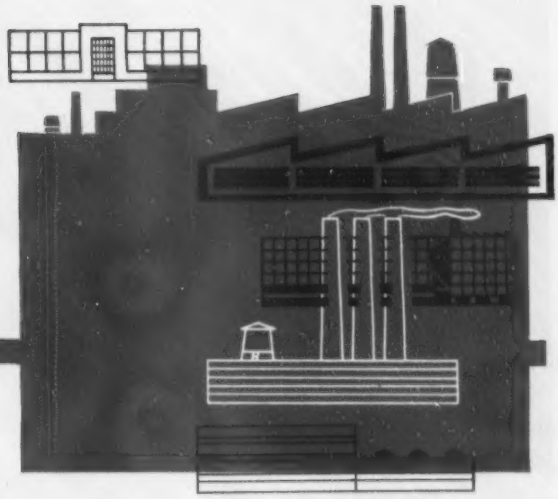
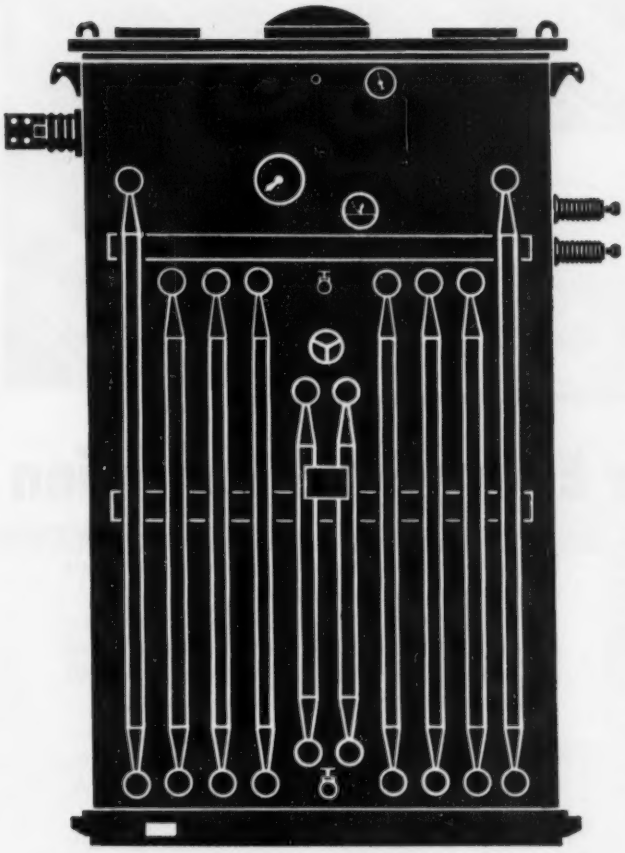
KUHLMAN *SAF-T-KUHL* TRANSFORMERS GIVE SAFER, LOWER-COST PERFORMANCE





Kuhlman Saf-T-Kuhl Transformers are filled with a patented synthetic cooling compound that is equal or superior to oil in di-electric strength, fluidity and thermal capacity. Yet the coolant is inert, non-explosive, non-inflammable and it will not sludge. The advantages of any unit employing such a coolant are well known.

- Saf-T-Kuhl Transformers can be installed anywhere in the plant without the use of expensive fireproof vaults.
- Voltage regulation can be improved and energy losses reduced by installing Saf-T-Kuhl Transformers near load centers and the expense of running long and large copper conductors can be eliminated.
- Floor space can be utilized exclusively for production by installing Saf-T-Kuhl Transformers above or below floor level.
- Maintenance costs are lower because the coolant does not require filtering or reconditioning.
- Insurance rates are lower in most states because Saf-T-Kuhl Transformers are absolutely safe and fireproof.

Saf-T-Kuhl Transformers are especially engineered to meet the requirements of heavy duty industrial service. The entire insulation structure is coordinated with the basic impulse level. Assemblies are thoroughly dried, and the coolant is introduced under vacuum to prevent entrapment of air and insure high insulation strength. Large ducts permit free circulation of the coolant to eliminate the danger of hot spots. Tanks are completely sealed. Cover and bushing gaskets are made from a special cork and synthetic rubber compound that gives exceptionally long life.

Kuhlman Saf-T-Kuhl Transformers are produced in a wide variety of single and three phase ratings. For complete information, write today for Bulletin CS-501. Kuhlman also manufactures, Power, Distribution, Dry Type, Subway, CSP and Series Street Lighting Transformers. Ask for bulletins on these units as well.

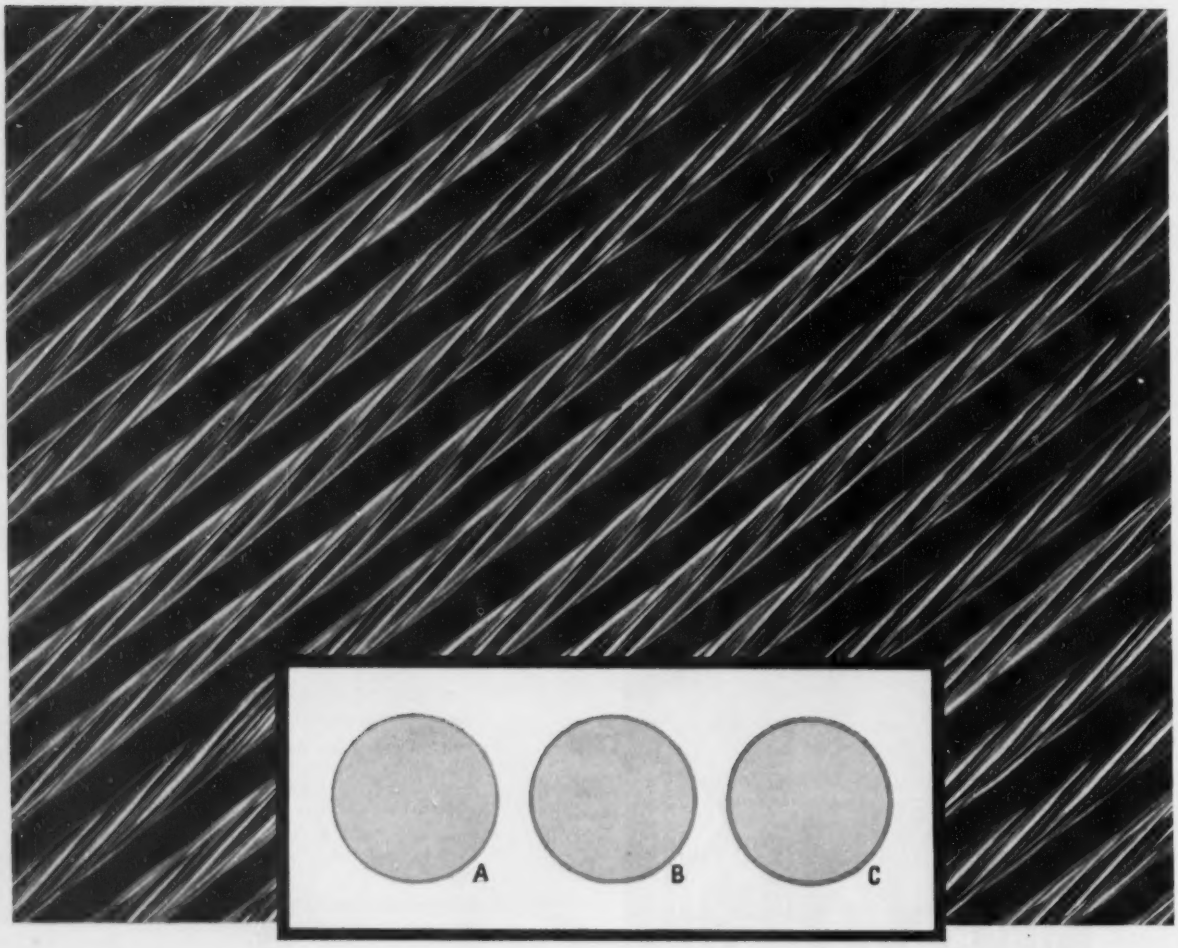
154-T

KUHLMAN

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN • Southern Division, CRYSTAL SPRINGS, MISSISSIPPI

EXPORT REPRESENTATIVE: INTERNATIONAL STANDARD ELECTRIC CORP., 15TH FLOOR, 50 CHURCH STREET, N. Y. 7, N. Y. CABLE ADDRESS: MICROPHONE, N. Y.

SIXTY YEARS OF PROGRESS IN THE ELECTRICAL INDUSTRY



A Strand Coating for Every Field Condition

Nowadays the purchaser of strand is in a much better position than he used to be. He's not limited to a single zinc coating. If he needs the equivalent of extra-galvanized, he can get it. If he needs something twice or three times as thick, he can get it. For Bethlehem makes its bethanized strand with a *choice* of coating weights – A, B, and C – to meet the demands of different field conditions.

Remember the old days, when you settled for a light zinc coating, because there was nothing else to be had? Maybe it lasted as long as you wanted it to; more likely it didn't. But that's no longer a vexing problem. Now, from Bethlehem's A, B, and C bethanized coatings, you can obtain the one that exactly meets your needs.

The lightest, coating A, is the thickness of extra-galvanized. B is twice as thick as A; C three times as thick as A. All are zinc of 99.9 pct purity. All meet standard ASTM specifications.

In many cases the A-weight will do the job required; but B or C is often the better choice. Actually, these heavier grades cost very little more than the A, yet last much longer under parallel conditions.

You are invited to call our nearest office for full details. Our engineers will gladly give you complete information.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHANIZED STRAND

BETHLEHEM STEEL

AIR CONDITIONED!

it's cool inside

GUTH

PEERLITE

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Permits flexible pattern planning. You can form any design you wish.
For 2, 3, or 4 lamps — 4′ or 8′ long.

more cooling
less cleaning

Wide open on top and bottom
for brisk air-circulation

Cool lamps last longer.
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RESULT: greater efficiency
less maintenance
long-lasting beauty

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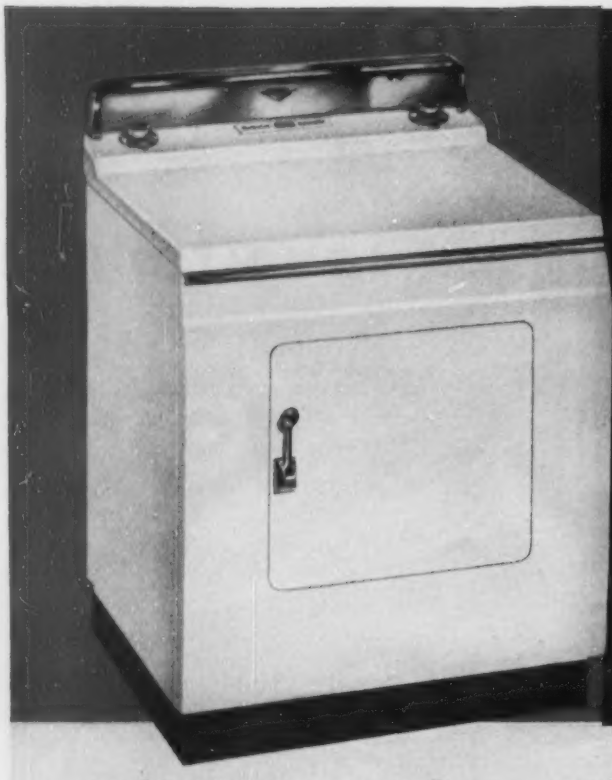


Developing
Greater Demand
For Dryers–
Greater Revenue
For Utilities...

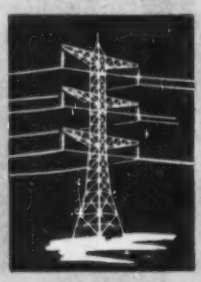
Hotpoint Automatic Dryers

Eliminate Heat, Lint and Moisture in the Laundry Area without Costly, Unsightly Venting!

SEALED-CHAMBER DRYING has increased Dryer acceptance by leaps and bounds, and provides *an important new source of profitable, domestic revenue for electric utilities.* Because heat, lint and moisture are sealed inside the Hotpoint Automatic Dryer, it can be installed anywhere in the home. Absolutely no venting is required, and clothes dry softer, sweeter and safer in sealed-in, sun-pure washed air.

Have your Hotpoint Distributor tell you about the Sealed Drying Action of the Hotpoint Automatic Dryer. It's a factual story that can put many more high-revenue Dryers on your lines.

Again, Hotpoint



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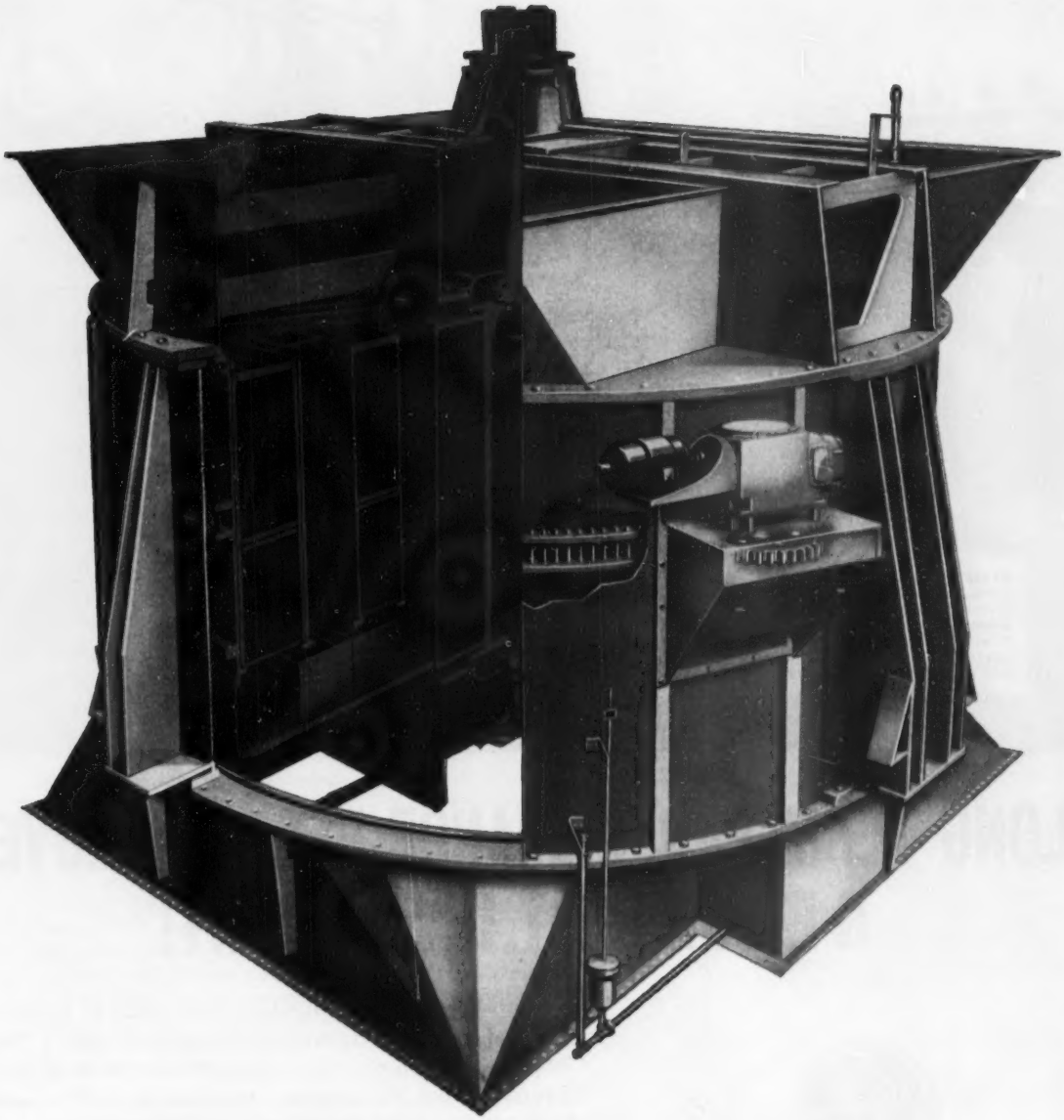


THE LJUNGSTROM AIR PREHEATER

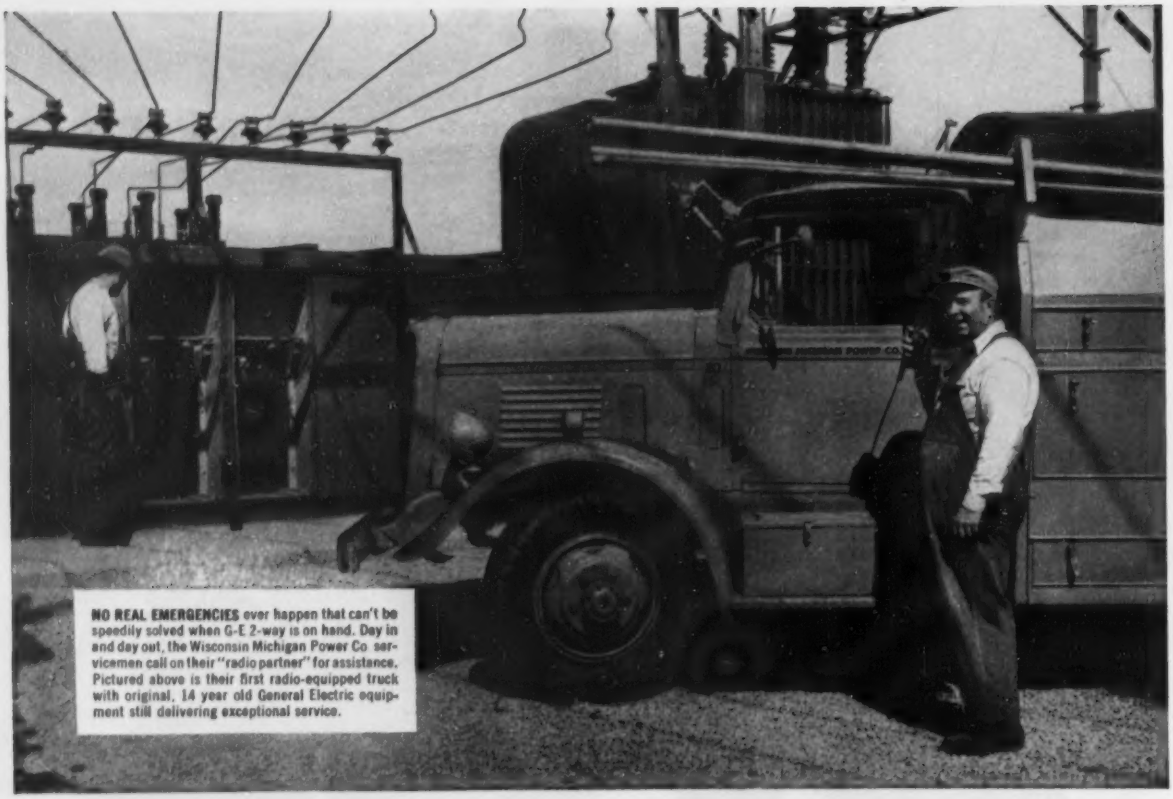
cuts fuel costs in hundreds of plants

The Ljungstrom Air Preheater has proved its value in industrial and utility plants throughout the country. That's why every year, a constantly increasing percentage of the total installed boiler capacity is Ljungstrom-equipped. *Your fuel costs will drop, too,* when you equip your boilers with Ljungstroms. The extremely high efficiency of the regenerative design means the greatest possible recovery of waste heat . . . with substantially lower fuel requirements.

If you are planning a new boiler installation — or expanding or modernizing your present one — let our engineers show you how the Ljungstrom can raise over-all efficiency in your plant.

Ljungstrom Air Preheaters are now available for boilers of any type or capacity from 25,000 pounds of steam per hour up.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.



NO REAL EMERGENCIES ever happen that can't be speedily solved when G-E 2-way is on hand. Day in and day out, the Wisconsin Michigan Power Co servicemen call on their "radio partner" for assistance. Pictured above is their first radio-equipped truck with original, 14 year old General Electric equipment still delivering exceptional service.

"LONG TERM PERFORMANCE RECORD PROVES G-E OUR BEST INVESTMENT!"

2-WAY MOBILE RADIO

FREQUENCY STABILITY & SELECTIVITY
guaranteed for life!

THAT's how an expert rates G-E 2-way radio! H. H. Brown, Chief Electrical Engineer, at Wisconsin Michigan Power Company, supports this high appraisal with the testimony of 14 years' service. The original installation in 1941 consisted of one 250-watt fixed station and three 30-watt mobiles. "Today, only one of these mobiles has been retired and we've *expanded with General Electric* to four fixed stations and 61 mobile units servicing two divisions."

Examine the advantages G-E 2-way offers and you'll quickly understand why it is *the preferred communication among utilities.* Get all the facts on G-E and then plan expansion. Ask your local Communications Counselor about the new "guarantee program" or, write: *General Electric Co., Section X191213-4, Electronics Park, Syracuse, New York.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

A DEPENDABLE COMBINATION

WHEN SHORT CIRCUIT CAPACITIES EXCEED STANDARD LEVELS

TYPE WAG SWITCH WITH *AMPLITACT*
TRADE MARK

The changing complexion of power systems all over the world, with the trend toward higher and higher short circuit capacities, is imposing more stringent duty requirements on transmission level equipment than ever before.

As there arose in the utility industry the need for a switch that could be safely applied on systems where short circuit capacities exceeded standard levels, Southern States developed and incorporated in its Type WAG Air Break Switch an entirely new contact design . . . the *Amplitact.*

This new contact has proven, in nation-wide installations, to be the answer to extreme system short circuit conditions that are now being accepted as normal by many utilities.

THE AMPLITACT AND HOW IT WORKS

Current passing from a switch blade through conventional contacts tends to relieve contact pressure. The relationship between members is such that magnetic forces, developed by current flow, oppose contact spring forces. Such magnetic forces are not great at rated load or relatively low fault currents, but at higher currents they become considerable and at some value of current they will completely relieve pressure, resulting in contact failure.

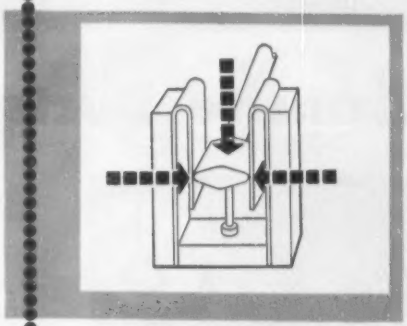
The *Amplitact* puts these negative forces to work in the following manner:

The schematic drawing, lower right, traces current through the *Amplitact.* Inner segments of loops are resilient and outer segments are fixed against rigid abutments.

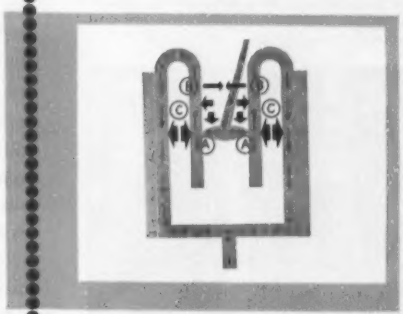
A. Current flowing through the blade changes direction 90° when current interchange is made at junction of blade tip and resilient contact. Resultant forces from these changes in current direction materially assist in holding the blade in the closed position.

B. Two parallel paths are formed for the current in the two resilient segments. Since the current is flowing in the same direction, these conductors tend to attract—thus increasing contact pressure.

C. Two parallel paths are also formed by the fixed and resilient segments. However, in this case the current is flowing in opposite directions in conductors in close proximity. The result is a powerful force from opposing magnetic fields which amplifies contact pressure in proportion to the square of the current flowing through the loops.



The above schematic drawing shows the relative electromagnetic forces resulting from current flow through the reverse loop members of the *Amplitact.* These forces greatly increase contact pressure and positively hold the switch blade in the engaged position.



WHEN AMPLITACT IS SUPPLIED

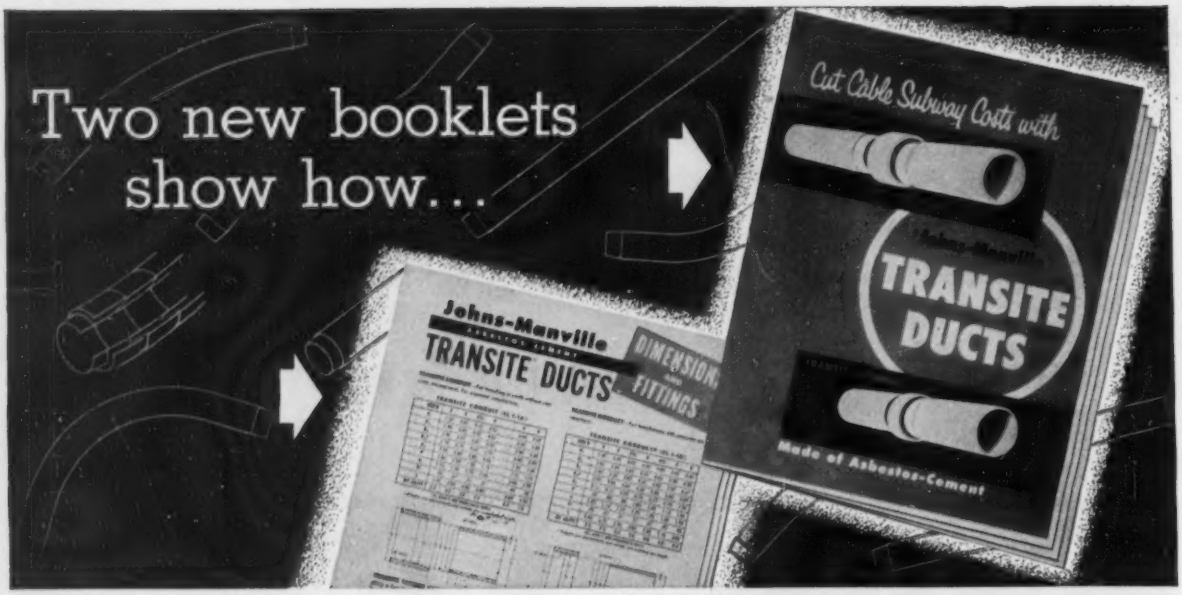
The *Amplitact* is a heavy duty premium contact supplied on all ratings of the Type WAG 1600 amperes and above. It is not supplied on switches rated 400 and 600 amperes. In switches rated 1200 amperes availability varies as follows:

7.5 KV—34.5 KV	Amplitact supplied
46 KV—161 KV	Standard Contact or Amplitact Optional*
196 KV and above	Standard Contact

*An extra charge is made for the Amplitact when it is specified in the 46 KV—161 KV, 1200 ampere ratings.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

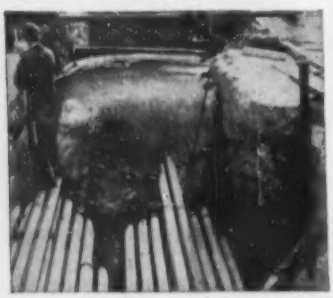
IN CANADA:
Dominion Cutout Co., Ltd., Toronto



Transite® Ducts cut cable subway costs—

give greater cable protection

Transite Conduit is the thicker walled duct which is used for exposed work or is laid directly in earth without a concrete encasement. Saves time, labor and materials on the job



Transite Korduct® is the thinner walled duct for installation in concrete. Inasmuch as it is used principally for hi-voltage lines, its high thermal conductivity reduces operating losses

• Johns-Manville presents these brochures as a service to public utilities, design engineers, and all other users and planners of cable subway systems. "*Transite Ducts*" shows how improved cable subway protection, installation, maintenance and operational savings may be achieved. "*Transite Ducts, Dimensions and Fittings*" give the necessary dimensional data on all ducts and fittings.

Transite Ducts offer improved cable subway protection. Made of asbestos and cement, Transite cannot burn, smoke, fume or generate explosive gases. Transite confines arc damage and protects adjacent cables against heat and flame. Transite resists corrosive action of soils; is unaffected by electrolysis.

Installation savings result because Transite is strong, light in weight, easy to handle. It comes in long, 10-foot sections, thus, fewer joints are required. Its permanently smooth bore prevents injury to cable either from natural movement or when pulling cable through. Maintenance savings result from the permanent nature of the asbestos cement composition of Transite. It is as durable as stone.

Moreover, operational savings result because cables run cooler due to the high thermal conductivity of Transite Ducts. This also results in prolonged cable insulation life.

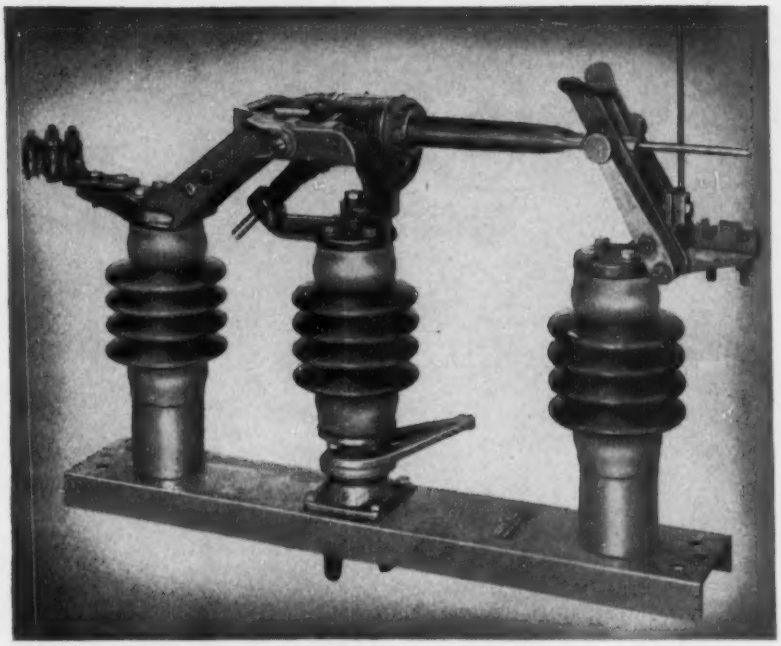
For complete details on how Transite Ducts can cut cable subway costs for your system, send for copies of "Transite Ducts," EL-29A and "Dimensions and Fittings," EL-45A. Write to Johns-Manville, Box 60, New York 16, New York. In Canada, 199 Bay Street, Toronto 1, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement



NEW!

AF20 SWITCH

BY 3E

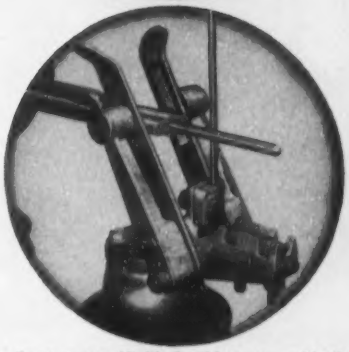
Vertical Break Switch with Rotating Blade

In this new 3E unit you'll find *all* the best in recent switchgear trends . . . *rotating switch* blade for easy action . . . *high pressure contacts at both ends* . . . heavy silver surfaces *at all contacts* . . . safety lock at both open and closed positions . . . and most important: the combination of these modern features with 3E's reputation for extra-heavy construction and sound design is a real guarantee for years of trouble-free service.

3E Rotating method makes operation unusually easy. In opening, the initial torque is concentrated on rotating the blade. This releases all contact pressure before the blade rises appreciably. Further operation raises the blade to full open position, and is remarkably easy because only the weight of the blade is concerned. This 3E feature eliminates a great deal of the usual abrasion of contacts and stress on the rest of the switch. Many engineers will find this design ideal where switches must be operated when heavily iced.

Ideal direct current path. The AF20 is designed for a minimum of contact points . . . and thus a minimum of possible trouble points. A hard-drawn copper blade nestles between identical contact systems at the front and hinge ends; so the current enters and leaves the switch under the same conditions. Contacts are hard-drawn copper bars with heavy silver inlays. Pressure is applied with strong low-stress coil springs.

Important construction and safety features. The smooth action is enhanced by careful selection of vital bearings. The blade rotates in a sealed Oilite bearing unit. A roller bearing is used at the top of the rotating insulator stack and a permanently lubricated, sealed ball bearing at the bottom. The blade locks in both open and closed positions and is over 90° from the contacts when open.

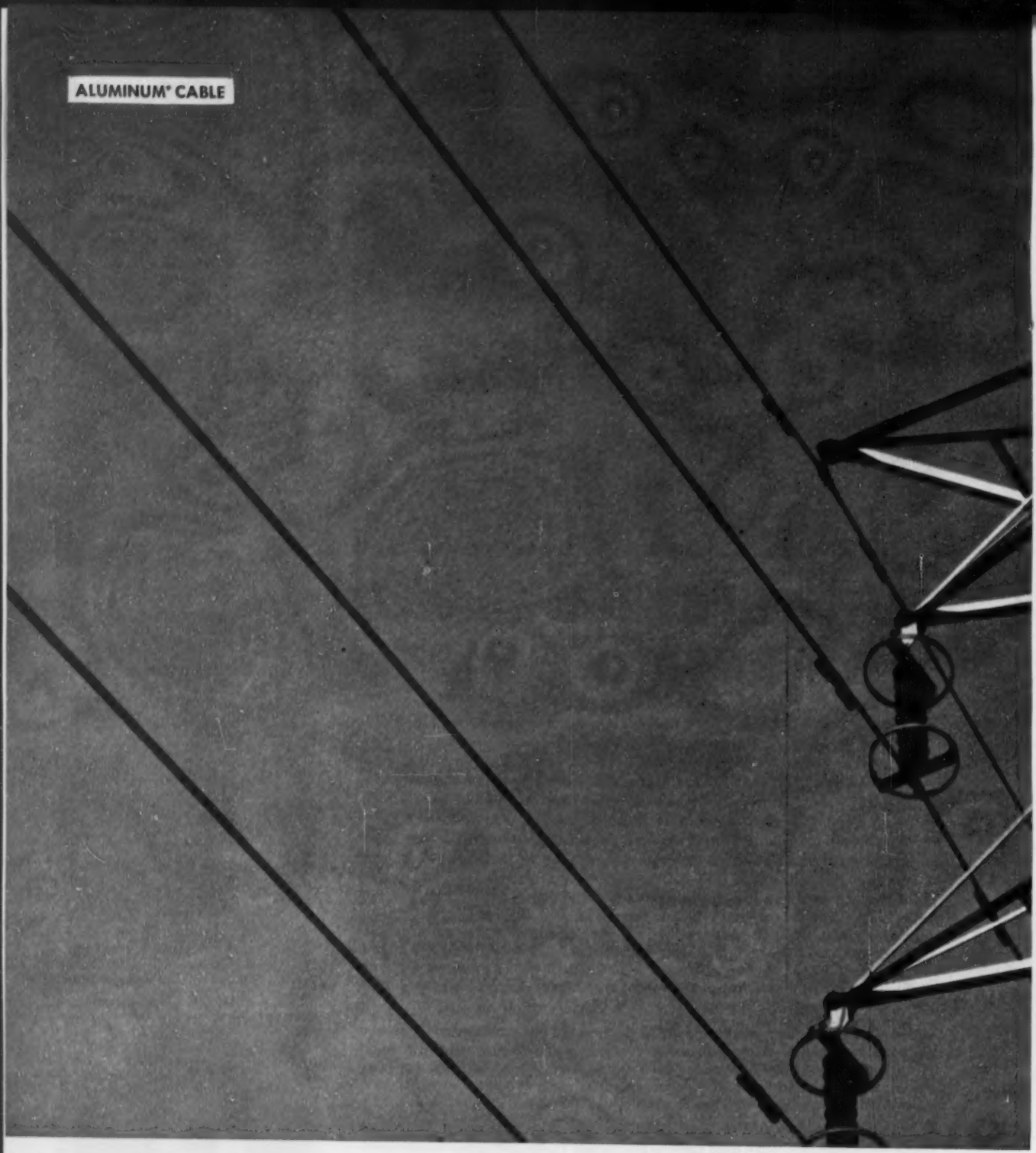


Front contact. Highly flexible system with silver inlays gives ideal contact plus long wear.

Hinge end view. Note rugged construction and 3E's strong, simple blade assembly.

FOR FULL DETAILS WRITE FOR BULLETIN 333

ELECTRICAL ENGINEERS EQUIPMENT CO., MELROSE PARK, ILLINOIS



Anaconda Recipe for ACSR...

Aluminum, Steel...AND CABLE EXPERIENCE

ANYONE can put Aluminum and Steel together!

But do you get what you want?

At Anaconda, we add still another prime essential —cable experience!

Not everyone has it. Cable experience takes *years* of "on the job" cable design, metallurgical research and manufacturing "know-how."

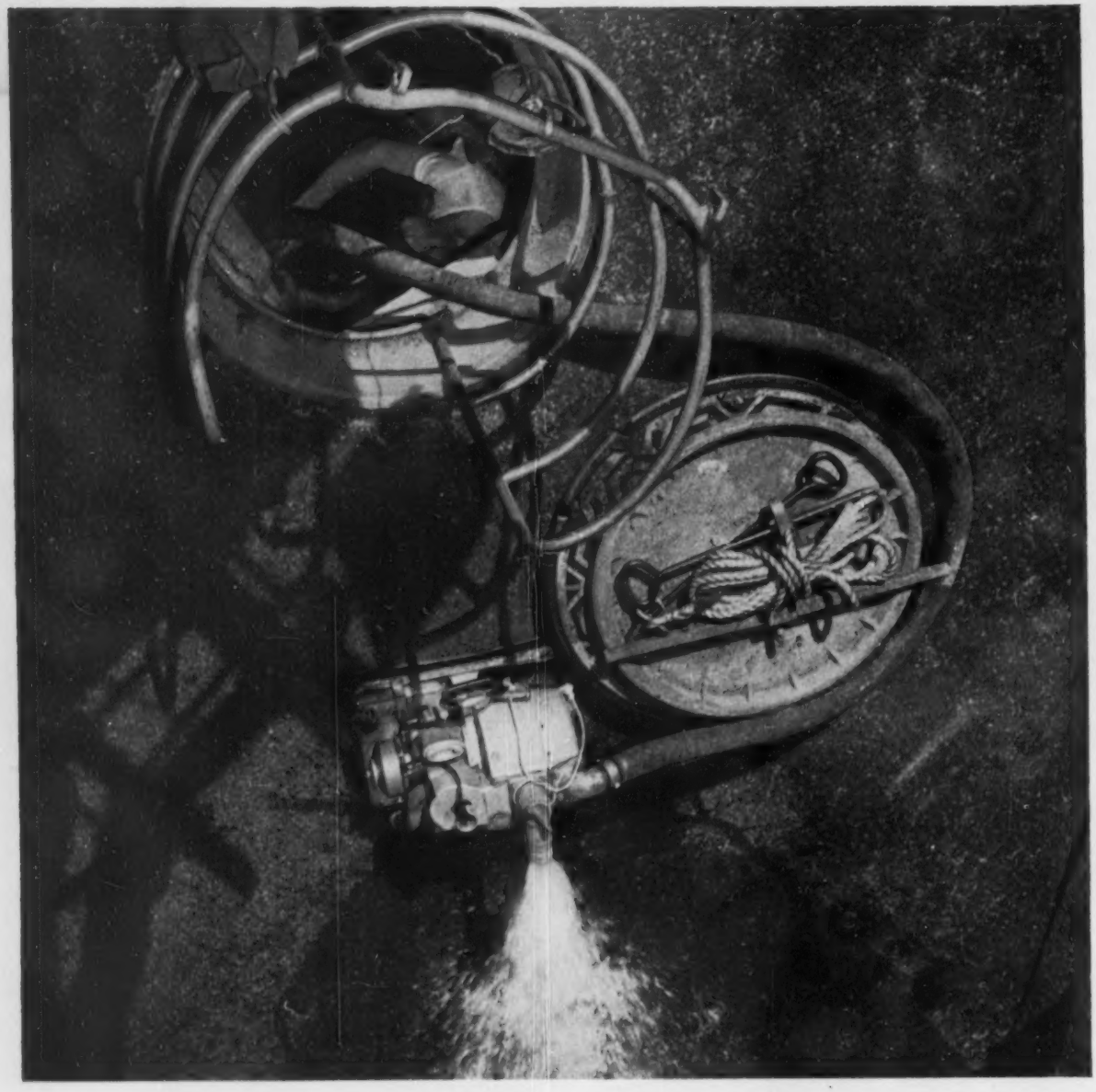
Such experience comes only from *living with* the problem.

We use this plus quality — cable experience — and the very latest equipment to make the finest cable.

And we manufacture and stock aluminum in 5 strategically located mills to assure you of quick, sure delivery. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.* 54390

ANACONDA®

Copper and Aluminum insulated conductors • Copper and Aluminum service cable • Wire and Cable accessories • ACSR transmission and distribution • Copper, Aluminum and Copperweld bare and weatherproof wire.



The pump is a HOMELITE . . . *of Course!*

With utilities, everywhere, Homelite is the popular pump. It's the gasoline engine driven pump that best suits their needs. Small and compact, it takes little space in a truck. Light in weight, one man can carry it easily. Yes, and when it comes to performance, a Homelite is "Mister Big". Starts quickly. Gives you fastest self-priming. Handles up to 15,000 gallons per hour. Holds seepage automatically at strainer level. Won't clog. And has a guaranteed suction lift of 28 feet.

Compare a Homelite . . . for size and performance . . . with any other pump. You'll want the Homelite . . . *of course!*

Manufacturers of Homelite
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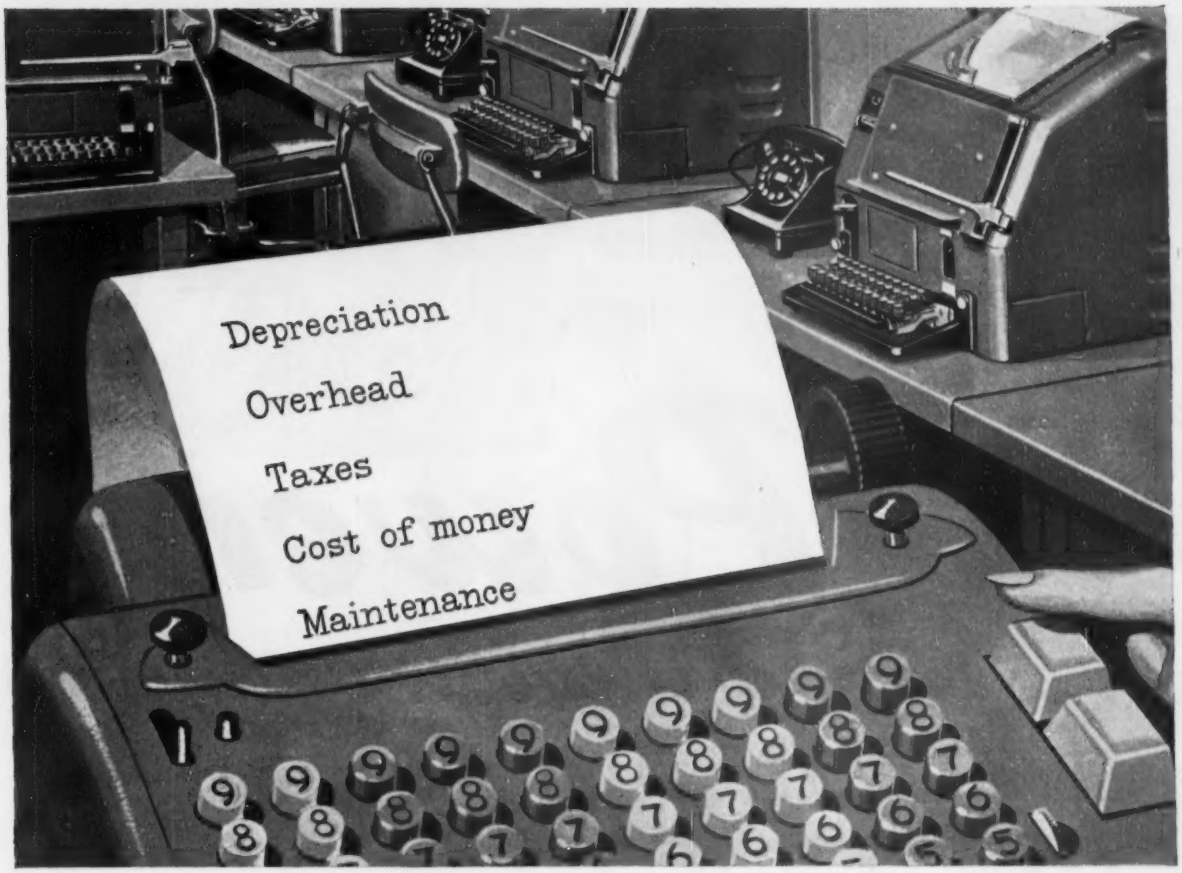


If you provide your own communications system...

HAVE YOU ADDED UP ALL THESE COSTS?

Owning and operating your communications system can be a costly experience, with many costs frequently overlooked. Depreciation, taxes, overhead, maintenance, loss of interest on capital all contribute to your total communication expense.

Bell System communications are low in cost. You pay only a fixed monthly charge for services tailored to your exact needs. No more, no less. Your capital is not tied up but left free for income-producing investments in *your* business.

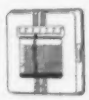
Service has just begun when Bell System communications are installed. Maintenance, replacement, inventory, storage, extension and rearrangement of service are all handled rapidly and efficiently—no longer problems for you.

Let us show you how Bell System know-how and experience can be put to work to solve your communications problems. For a complete communications study, made without charge, call your local Bell Telephone representative today.

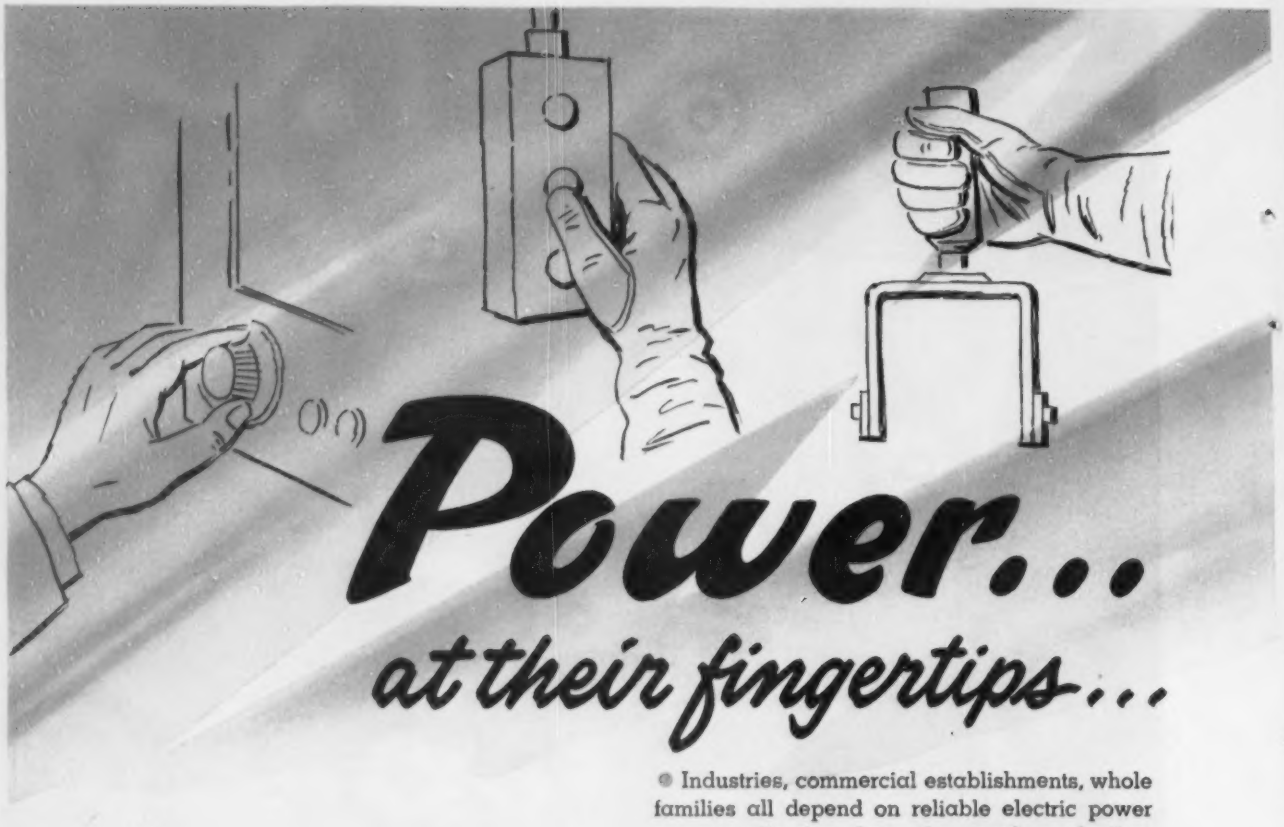
PRIVATE-LINE TELEPHONE

TELETYPEWRITER

MOBILE TELEPHONE


METERING CHANNELS

BELL TELEPHONE SYSTEM



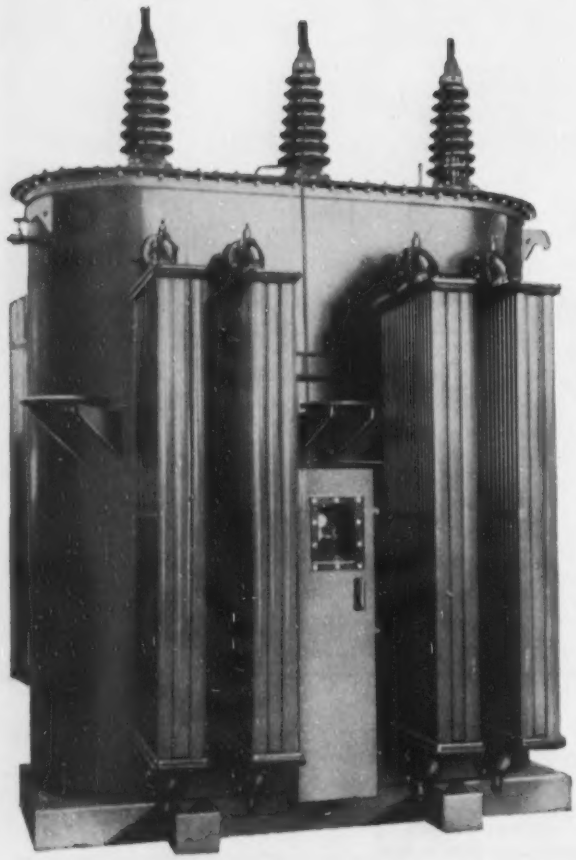
Power... at their fingertips...

Industries, commercial establishments, whole families all depend on reliable electric power as a motivating force for good production, effective lighting and essential home comforts.

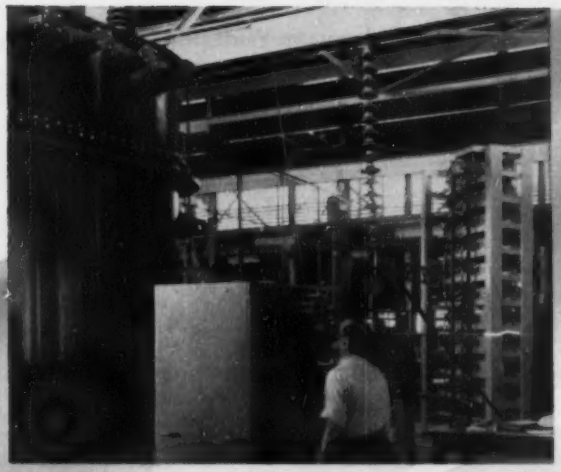
For 36 years Standard Transformer engineers, working with utility company engineers, have designed and manufactured better transformers for more efficient use and dependable channeling of electric power. Service records, dating years back, prove the dependability; the economy; the low maintenance cost of STANDARD Power Transformers.

STANDARD Power Transformers are embodied with compactness of design, inherent strength and exceptional stability. Manufactured with extreme care, STANDARD Power Transformers are built to your specifications. STANDARD engineers, working with your engineers, arrive at the best construction and design for your particular needs. Normal loads . . . and overloads can be handled again and again whenever emergencies arise.

There's a Standard Transformer representative near you. Call him. Have him help you with your power transformer installation.

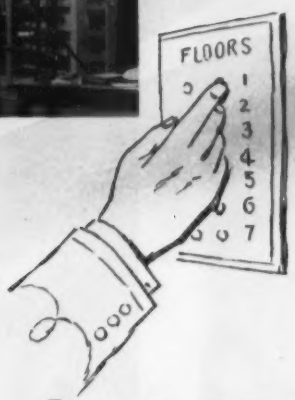


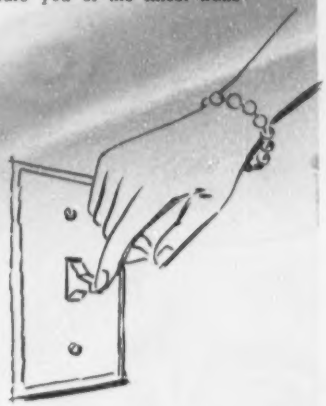
STANDARD Type AT, OISC Power Transformer, 7500 KVA, three-phase, 60-cycle, 66,000 to 13,800 volts, gas-seal construction, equipped with lightning arrester mountings and arranged for addition of forced air cooling.



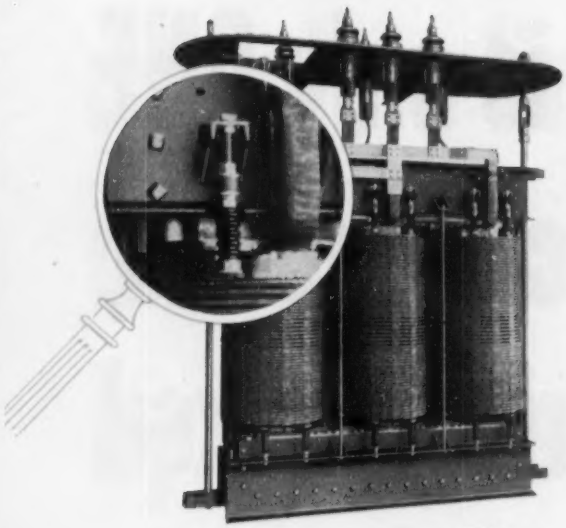
TESTING

This man is impulse testing a large Power Transformer in STANDARD'S modern plant at Warren, Ohio. A surge generator, with a range of one million volts, is used for ASA and NEMA standard and front-of-wave-impulse tests. Each transformer, no matter what the size, is subjected to standard commercial tests—both during manufacture and at completion. Experienced, thorough testing and inspection assure you of the finest transformer performance.



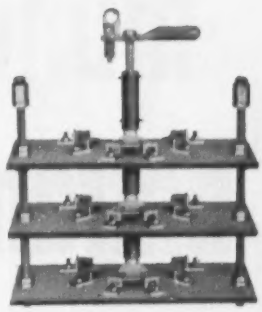


PUT THERE BY *Standard* TRADE MARK POWER TRANSFORMERS



TAP CHANGER

STANDARD'S specially designed three-deck tap changer switch is externally operated without excitation. It also has positive contact with wiping action which has proven dependable for many years. Normal settings are with a 4-tap voltage selection . . 2½% taps within 10% range of normal rating. STANDARD supplies transformers with 4 taps above or below, or half above and half below as specified by the customer at no extra cost. Contact-making points are submerged in oil.



CORE AND COIL ASSEMBLY

This view shows the low voltage side of the core and coil assembly of a Power Transformer. Note STANDARD'S special design spring bracing with compression-type porcelain insulators on high voltage coils to compensate for the movement of coils during short circuit. It also compensates for shrinkage of the coil in operation.

Standard

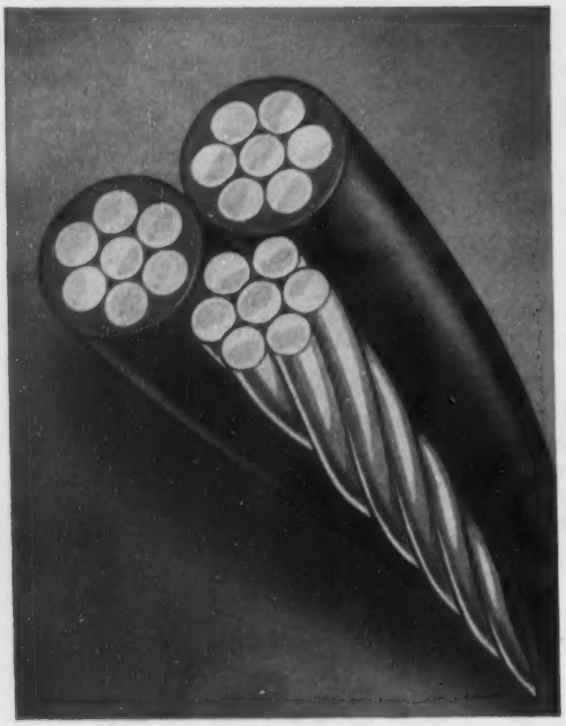
THE STANDARD TRANSFORMER COMPANY

Trade Mark

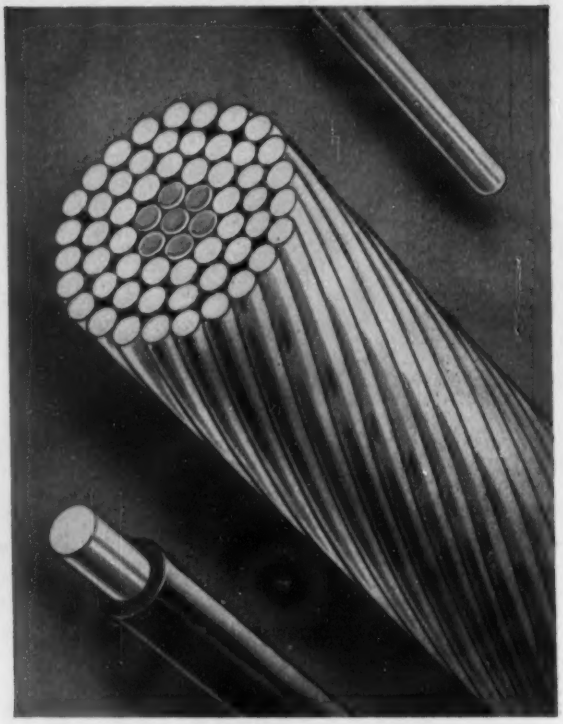
WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Covered Wire and Service Drop

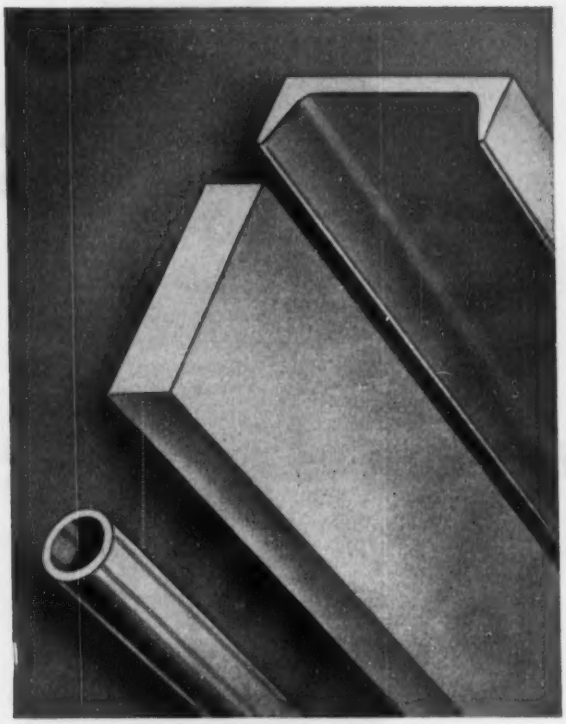


ACSR and All-Aluminum Wire and Cable

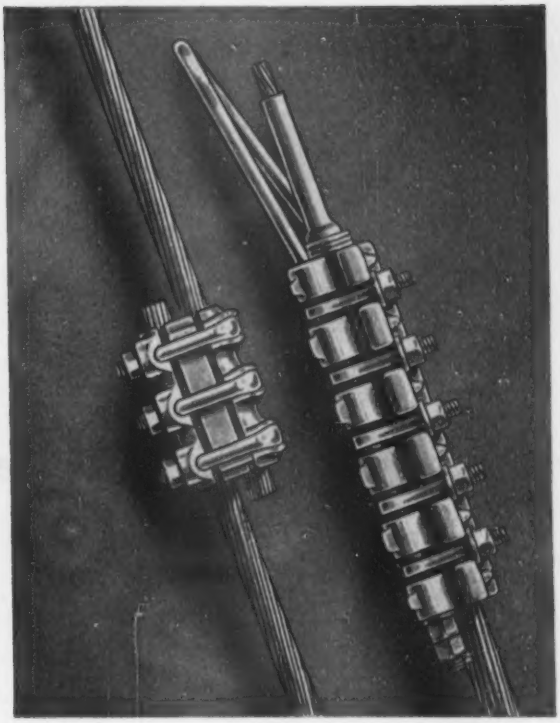


There is only ONE transmission conductors, accessories backed experience...

Rectangular and Tubular Bus



Fittings and Accessories



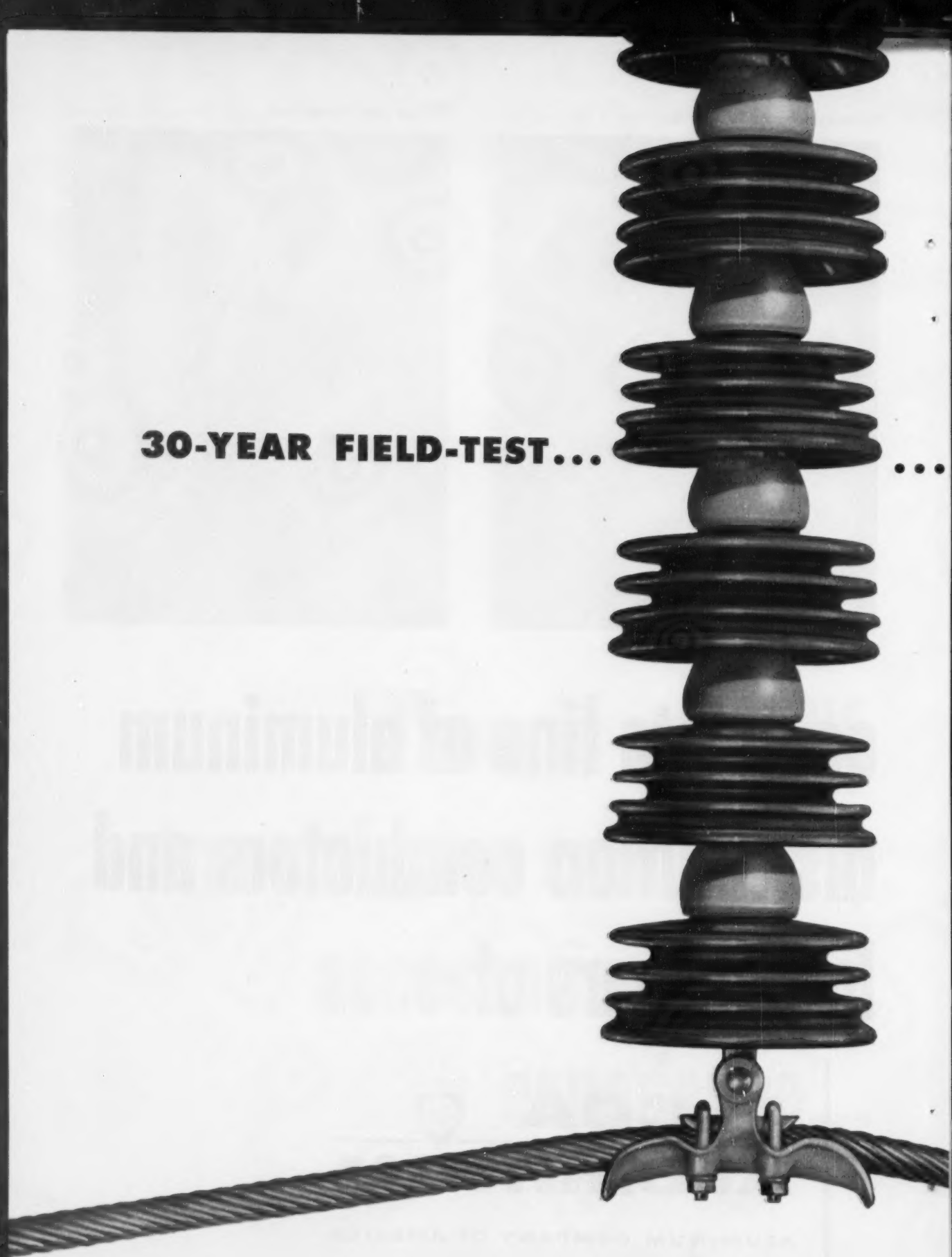
complete line of aluminum distribution conductors and by 56 years of

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

30-YEAR FIELD-TEST...

...



....PROVES LAPP FOG-TYPE DESIGN

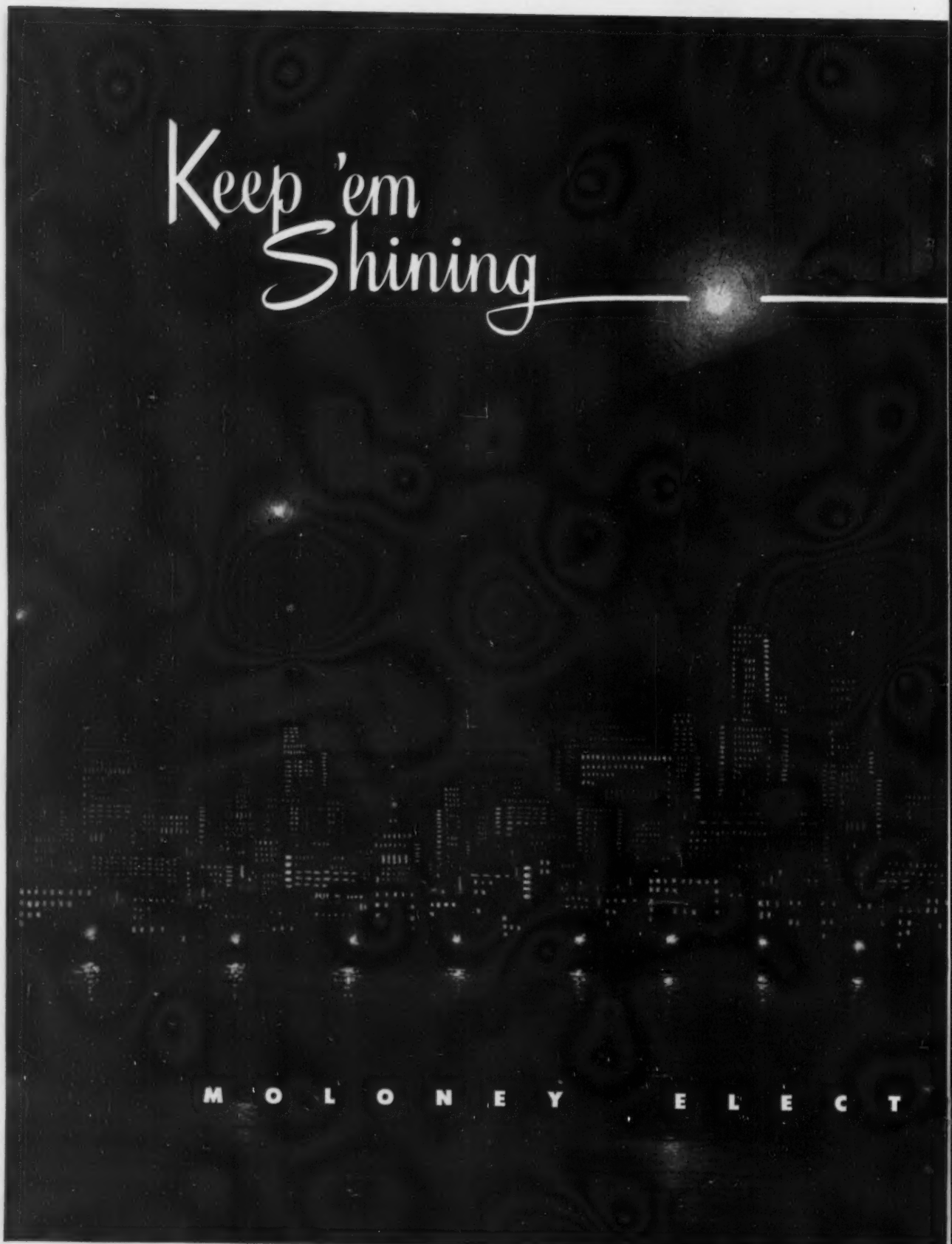
In 1924, the Lapp Fog-Type suspension insulator was designed and first put into service. The design has remained virtually unchanged for the 30 years. It is the "standard" for successful performance in dirt conditions—every "fog-type" insulator which has ever won acceptance or achieved continuity of production has been based on the same principle of multiple short petticoats providing *exposed* leakage path.

Successful application of this design principle for contamination problems has been by no means limited to suspension discs. It is a primary design consideration of the Lapp Line Post and Station Post insulators—and one basic reason for the superior operating performance of these units for line and station duty. Such fog-type surfaces have become standard, too, for high-voltage bushings, which, with nearly all of their surfaces exposed, traditionally "get by" with shorter leakage distances than are required of switch and conductor insulators in the same stations.

There are, of course, sound reasons for the superiority of the *exposed* leakage path. In the first place, it provides a *uniform* leakage path, avoids concentrated hot-spots where local stress can precipitate flashover. Also, Lapp Fog-Type corrugations are self-cleaning. A maximum of the surface area is exposed to rain and wind which flush off contamination, to increase resistance and reduce leakage current.

For transmission duty in contaminated atmosphere, Lapp Fog-Types offer a *proved* record of operating security, long life and low upkeep.

Lapp Insulator Co., Inc., Le Roy, N. Y.


Keep 'em Shining
M O L O N E Y E L E C T

Shining lights attest the reliability of your system . . .
and under these lights, your customers are finding more and more uses for electricity. These mounting uses impose new demands upon your system and greater strains on transmission equipment.

Thus, a new power picture has been created requiring greatly increased transmission voltages for more electricity to meet demand. To handle these higher voltages, your system needs dependable transformers designed and built for the purpose. Moloney designs and fabricates power transformers of unlimited size and Kva rating to meet your present and future needs. And every transformer produced by Moloney shares the Moloney reputation . . . the reputation for performance and durability that has made our trademark the "Mark of Quality", everywhere.

ME54-44

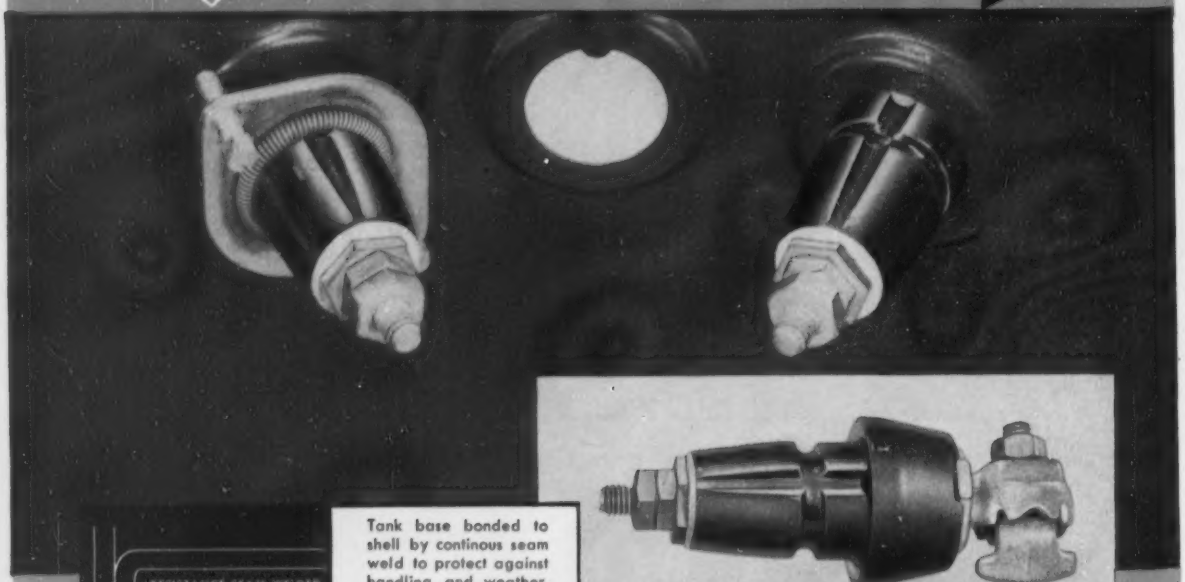
Moloney Power Transformers, engineered and built to your specifications, are available in any Kva and voltage rating for utility and industrial applications.

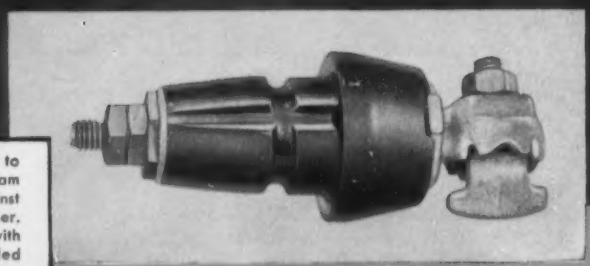
R I C C O M P A N Y

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations Network Transformers • Constant Current Transformers • Capacitors • Transformers for Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

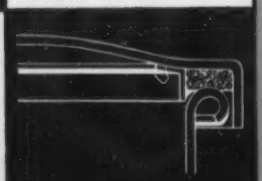
KEY TO SAFETY

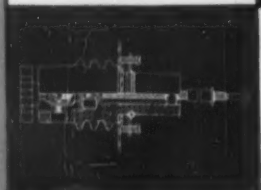




Tank base bonded to shell by continous seam weld to protect against handling and weather. Inside edge coated with sealing mastic and rolled in to form lasting barrier against moisture, air and rust.

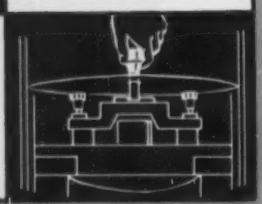
Corprene gasket retained by ring welded to tank cover. Gasket is retained in position forming a perfect tank seal. Gasket is not cemented and can be used again and again.





Moloney sidewall mounted high voltage bushings are provided with a molded, high impact resistant phenolic-cold rubber protective cap for working "hot".

Tap changer operating handle located above hot oil level. Double-moving contacts snap into position with a wiping action to assure positive contact.



Key and slot mounting of Moloney HiperCore Transformer *low voltage* bushings literally locks them to safety . . . gives your linemen solid leverage for tools. These bushings can't slip or turn under torque. Safety is inherent, too, in the sidewall mountings that permit either above or below vertical take off. The solderless type terminals will accommodate conductor sizes according to NEMA standards.

Made of high-strength, dry-process porcelain, the bushings meet utility requirements. Moloney HiperCore Transformer bushings are designed to function under any operating conditions.

Specify Moloney HiperCore Transformers and give your distribution system dependability . . . the mark of Moloney for 58 years.

MEP4-50

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

"Wake Up!" Cries the Rooster

No one can accuse the electrical industry of undue haste in putting electricity to work on the farms of America. "Make haste slowly" is the motto that fits the case.

Three years ago Electrical World published a study of farm electrification which had been made in cooperation with the National Electrical Manufacturers Association. In this issue is another, this one the result of collaboration by Electrical World and Electricity on the Farm Magazine.

Approaching the subject from entirely different angles, the two studies arrive at the same conclusion: Use of electricity on the farm lags woefully behind use in the home, the factory, the store, behind use by every other area of the economy in this mostly highly electrified nation in the world.

The reason for this is not far to seek. Farm electrification simply is not getting from the electrical industry—manufacturers and power suppliers, cooperatives included—the attention merited by its importance.

Take a check to see what your company or co-op is doing to push up its rural power sales:

• Is your rural sales department organized to do its job? Does the farm potential get sufficient attention from top management?

• Are you getting the market figures you need to do an adequate promotion job? Our survey returns indicate many companies are not. One eastern company that is getting and using the equipment and appliance saturation figures in its own service area has pushed annual average farm usage from 4,557 kwhr to 5,140 kwhr during the course of a single year. This is a 12.8% increase.

• Are you following through once you get the figures? Can you show dealers and distributors in your service area the relative saturation figures—possibly keep tab on the competitive positions of the various dealers?

• Are you fully joining in with other agencies and firms in your service area which have a civic, social, or economic stake in promoting electrical farming? These might include the extension service, community clubs, farm organizations, and others which aim to improve the farmers' lot by electrical and other means.

• Is your utility competing successfully in selling electricity over other types of energy?

A few electric companies and some co-ops can answer "yes" to every one of these questions. But the survey results (p 103) indicate that too many power suppliers must answer negatively to the key questions. They do not know their present markets in farm electrification and hence cannot appreciate its potential.

Gracing the pages and cover of this feature issue of Electrical World is a symbolic rooster. "Wake up!" is the rooster's cry. It's long past time for real effort, lots of it, to be put into the job of electrifying the farms of America.

Adequate Wiring by Edict

The borough council of Dumont, N. J., believes that adequate wiring is a matter worthy of municipal attention. Accordingly it will hold a hearing this month on a proposed ordinance which would require 100-amp minimum service entrances for homes to be built in the borough.

This would be accomplished by amending the building code to require that not less than No. 2 residential service entrance conductors be used. Panelboard capacity required under the proposal would consist of not less than one 50-amp, 3-wire 240/120-v branch circuit, not less than one 25-amp, 3-wire 240/120-v branch circuit, not less than two 20-amp, 2-wire 120-v appliance circuits, and not less than ten 15-amp, 2-wire, 120-v circuits.

Laudable as is the objective of the proposed Dumont ordinance, there are some drawbacks to accomplishing it in this manner:

1. Building regulations based on the National Electrical Code are intended to provide safe installations. Regulations based on other objectives may be less willingly accepted and more difficult to enforce.

2. Building codes tend to become restrictive. To specify a minimum service entrance runs the risk of setting the maximum.

Some other communities already have 100-amp minimum residential entrances either because of prevailing practices or utility requirements. This has been accomplished without resorting to building code regulations.

As an alternative to the proposed Dumont ordinance, the borough council could encourage the acceptance of the standards proposed by the new Residential Wiring Handbook (EW, Sept. 20, p 110). These well-considered proposals vigorously promoted and accepted on a local level would make building code changes unnecessary.

Hartford Protects Trees and Utilities

The poet who said "Only God can make a tree" registered in memorable terms the sentimental feeling most folks hold toward beautiful trees. While people appreciate electric power for its utility, this appreciation is often overwhelmed by their reverence for trees. Sometimes this conflict of attitude is so great that it leads to open rebellion against clearing right-of-way for transmission and pruning for wire clearance of distribution systems. Fortunately that spirit has been subsiding, and now a new move promises to reconcile the storm needs of power companies with the regard in which the public holds its trees.

One sure way to save the tree-bordered streets is to separate the lines of trees from the lines of poles and wires. That can keep the wind-blown or ice-laden tree limbs from weighing down the wires to the point of snapping and circuit interruption. There are two ranges in which this separation can be achieved—the vertical and the horizontal. One approach is the resort to ornamental shade trees that reach a height of only 25 ft and thus never overhang the power wires. The other is to move the line of trees laterally away from the curb line which is the usual location for overhead distribution circuits.

Both solutions are being tried on a limited scale in Hartford, Conn. It is a well-balanced and well-represented movement. Tree wardens, garden clubs, forestry associations and the wire-using utilities are setting out to give the low-growing trees (see characteristics, EW, April 7, 1952, p 152 and April 21, 1952, p 150) a trial. Initially the move will be made in city parks fronting on public streets. Later it will become a matter of planting these trees on private property with permission of the property owner. A state law already authorizes cities to plant within 10 ft of the highway, and under the program initiated the city would be responsible for the care of shade trees, large or small, when thus located on private property.

This all sounds like as thorough and intelligent a program as has been instituted anywhere. Its success should alleviate the tree argument and show the tree-lovers they can have their trees and their uninterrupted power, too.

TVA Tells Its Story Often and Well

"Seven million people, give or take a few, will visit the dams and steam plants of the Tennessee Valley Authority in 1954. Most of them will have questions to ask. The men in the olive-green uniforms who do most of the answering are the 400 officers of TVA's Public Safety Service. They are TVA's trained experts at meeting the public. In their 21 years as a protector and visitor reception corps they have welcomed more than 55 million visitors—kings and queens, Congressmen and diplomats, students and teachers, and a good many million plain American tourists."

This is the opening paragraph of a story sent Electrical World (and probably several hundred other magazines and newspapers) by TVA's efficient Information Office. It explains in part the terrific hold the TVA legend has on the American public. Close to seven million Americans a year are getting "red carpet" treatment from the men in olive green. And the treatment includes the TVA story written by TVA public relations experts and told just the way they want it by "TVA's trained experts at meeting the public."

Let's Call a Spade a Spade

"The electric utility looks at agriculture as an industry to which should be applied the same efficient mass production methods used so successfully by other industry."

This was a statement of Pres Charles Oakes of Pennsylvania Power & Light Co at the first public showing of the Diamond Jubilee Farm.

Oakes, whose company serves the Jubilee Farm, expresses here an idea that has taken all too long to penetrate utility thinking. It wasn't long ago that the bulk of the electric companies treated the farm as strictly as residential load. Many still do. But the fact remains that when farms have connected loads up to 150 kw, as the Jubilee Farm does, they have to be treated as something other than a mere house load. They fall more in the category of a commercial load in terms of energy use even though they have some residential characteristics.

If Oakes' statement is applied along with some imaginative planning and action, there is no reason why America's farms—in less time than it took for lines to be built to them—can be truly electrified, yes even "Jubilee-fied" too.

THE ELECTRICAL WEEK

The Issue's News Highlights . . . Dixon and Yates speak out in defense of their contract with AEC, calling it best financially the government has made . . . MVGC presents plan for financing West Memphis plant to SEC.

AG&E's Sporn sees atomic power making up small portion of total power generated by 1970. But GE's Cordiner expects 50% of new plants built by 1976 to be atomic.

Mississippi Court rules co-op can be made liable for lowering property values on highway right of way.

Electric output for the week ended Dec. 4 soared to a record 9,612,000,000 kwhr and off EW's recording chart (See p 101). It was the seventh top-mark reached this year. Cold weather in the week ended Dec. 18 could bring a 10-billion-kwhr high.

TVA is a "fictitious yardstick," and a "economically unsound power project," according to Edwin Vennard, president of Middle West Service Corp. Last week in Muskegon, Mich, he told Town Hall Meeting of the Air, "the federal government makes the donations to TVA, donations of your money and my money . . . and charges no interest for that money. If I adjust TVA earnings for these subsidies, then TVA must double its revenue to break even."

Sen John Sherman Cooper (R-Ky.), defeated for reelection in November, will not shelve his plans for putting TVA on a paying basis. He will publish the bill he proposed to introduce to enable TVA to finance its own generating plants without having to appeal to Congress for funds.

Utility common and preferred stocks listed on the New York Stock Exchange at end of October led all other industries with a market value of $25.5 billion. Utility bonds also ranked first with market value of over $9 billion.

Electric industry, it is estimated, will raise a record $2.1 billion in security offerings in 1954 compared with $1.7 billion in 1953.

GE announces synthesis of new thin-film heat-resistant wire insulation. Known as Alkanex, it will permit increased horsepower in motors without increased size; raises limiting temperature for long life to 300 degs F; can be applied by standard enameling equipment. . . . GE also announces it has developed new form of irradiated polyethylene, Irrathene 201, for use as turn insulation on circuit breakers.

SEC rejects a proposed rule setting special standards which would make it easier for public utility holding companies to get approval of employee stock option plans.

Off the Washington Wire . . . Henry Taliaferro, chief of Reclamation Bureau's Power Division for less than a year, is leaving to join New York State Power Authority. No successor has been named yet.

Geological Survey is streamlining its historical river data into a series of 21 volumes summarizing all available streamflow records. New England data is now available in "Geological Survey Water-Supply Paper 1301." Colorado Basin will be the next project completed.

FPC reports indicate rate for combustion of coal for production of electric energy dropped to an all-time low of .97 lbs per kwhr in October.

Five New York utilities will not relax their efforts to get Congressional approval to undertake redevelopment of Niagara River. Robert E. Ginna, executive vice president of Rochester G&E, one of the five firms, told a recent Region 2 PUAA meeting bills for the power company redevelopment would be reintroduced in Congress as soon as it reconvenes. A check of election results, he said, showed 222 of the 262 Representatives who voted in favor of the bill in the last Congress were returned.

Fact-finding panel has recommended a 3.75% pay hike for IBEW-AFL workers at Public Service E&G . . . California Electric Power and IBEW signed new one-year contract, effective Dec. 1, providing no wage increase. But company's contributions to workmen's compensation, life and medical insurance is equivalent to wage increase of $9 a month.

Washington Water Power has asked FPC permission to build an $87-million, 385,000-kw hydro project on Clark River at Noxon Rapids . . . Rochester G&E plans 85 Mw fourth unit at Russell Station.

Additional utility taxes are being proposed in West Virginia to raise money to improve the state's highway system. A legislative committee is now studying a bill proposing to raise taxes on real and personal property and public utilities by not more than 50% of current rates.

Winner of the 1954 Edison Medal is Dr Oliver T. Buckley, retired president of Bell Telephone Laboratories, Inc. Harry A. Winne, retired vice president of General Electric Co, is the winner of the 1954 John Fritz Medal. Both medals will be presented next February at the Winter General Meeting of American Institute of Electrical Engineers.

Executive Changes . . . C. H. Lanphier, executive vice president and chief engineer of Sangamo Electric, was elected president, effective Jan. 1. He succeeds D. S. Funk, who assumes newly created post of board chairman.

Dixon and Yates Speak Out . . .

. . . in Defense of Their Contract

Last week backers of the Dixon-Yates contract spoke out.

In rapid succession at three meetings, Edgar H. Dixon, president of Middle South Utilities, Inc, and E. A. Yates, chairman of Southern Co, disposed of the veil of sinisterness that had been cast over the whole affair by the contract's opponents.

While public power advocates and supporters of TVA expansion were having a field day attacking the proposed contract to supply power to the Atomic Energy Commission, the actual parties to the contract had relied almost entirely on government documents and spokesmen to present the defense.

On Nov. 11, the contract was signed between the AEC and the Mississippi Valley Generating Co, the firm created by Middle South and Southern to build the 650,000-kw plant at West Memphis, Ark., to supply the AEC power by replacement with TVA.

On the National Broadcasting System's "Meet the Press," before the National Press Club in Washington, and before a regional meeting of the Public Utilities Advertising Association, Dixon and Yates made these points:

- They have no desire to take over or invade TVA territory.
- The contract guarantees nothing to the builders.
- The contract will save taxpayers $100 million in construction costs.
- There is a limit on earnings of not more than $600,000 a year.
- The companies undertook the contract because they were in the territory where AEC wanted the power; had ample reserves in case of trouble; and were already supplying power to TVA.
- The contract is the best financially the government has yet made with a private company.

This is a far cry from some of the charges leveled by the attackers. They had found the proposal was a "bad financial arrangement," an "unsound engineering scheme," a "giveaway," and a "scheme to whittle away at the TVA" by "the worst enemies of TVA." The proposal had been branded as guaranteeing the builders a 9% return on their investment—an agreement "with a built-in profit system," awarded without competitive bidding.

. . . on Meet The Press

Dixon and Yates had to answer some searching questions from a panel of four reporters and a moderator on "Meet the Press," Dec. 5. Key questions and answers follow:

Q. "Are you out to destroy the TVA?"

Dixon: "Well, that is just not the fact at all. We've been neighbors of TVA for a long time. It's a very fine public utility system. Now, I don't happen to like the rules under which they operate, but they have competent people . . . The only difference is we pay interest and taxes and cost of money from which they are relieved. We have no fight with the TVA as another operating utility, and we have no desire to take them over, or invade their territory."

Q. "If you had your way, would you like to see TVA turned over to private enterprise?"

Dixon: "No sir. I would like to see the TVA subjected to the same rules we have. T VA is a public utility system. It is no longer a social experiment. And we're subjected to regulation by the Federal Power Commission and the Securities and Exchange Commission, and by local regulatory agencies. We've got to have certain capital structures. I think they ought to have the same rules if they are to be a yardstick and a competing utility system."

Q. "Is it true that the contract provides that for every $1 million of additional construction costs that you incur, the government will have to pay you an additional $28,000 a year capacity charge?"

Dixon: "And we also pay an additional $28,000—we share whatever the overrun should be—and beyond a certain point we take all of it. So we have every incentive to do a good job. And I guarantee that we've done a good job."

The subsequent line of questioning then dealt with charges that the engineering firm of Gibbs & Hill had been pressured into withdrawing from working with the von Tresckow group.

Dixon noted that when the charges had been made he had been subpoenaed to appear before a Senate committee but was then excluded from the hearing and given no chance to answer the charges, or even hear them. The president of Gibbs & Hill, he said, swore under oath that this was not true.

They were then asked:

Q. "Why didn't other utilities operating around TVA come forward?"

Dixon: "I don't agree that there were 5 or 6 utilities capable physically of doing the job. You forget that this power was required at Memphis. And you forget that the government and the AEC very wisely insisted on the right to cancel."

Q: "What first prompted your interest in this matter?"

Yates: "I was prompted by the President's message in the budget in January (mentioning need for additional 600,000 kw of power in Tennessee by 1957)." Yates was asked several questions relating to this initial interest, aimed at bringing out who had actually initiated the negotiations leading up to the contract. Subsequently Dixon broke in to clarify this point.

Dixon: "If I may interject. I think I was in it a little earlier than Mr Yates. Initially the inquiry was to an entirely different utility company president . . . The AEC made inquiries to Mr Wes (J. Wesley) MacAfee, president of Electric Energy, Inc, which was a company formed by five utility systems that joined together to supply a very large AEC load near Paducah . . . As discussion developed it became apparent that it was not in the interests of the taxpayer to put added facilities near Paducah. More money could be saved by putting them at Memphis."

Q: "As I understand it, the government guarantees you 9%?"

Dixon: "They guarantee us nothing. And it is one very great misconception that I'm delighted to clear up. We have said that we will build a plant that we estimate will cost $107 million. If the costs exceed that, our earnings decline. If the costs are less, the government's power bill declines and we make a modest profit. We have taken precautions to ensure that the profit will always be modest. We may not make more than $600,000 in any year, no matter how fortunate we may be. We have another great risk in that the government may cancel at any time they wish, either before the plant is completed or at any day upon completion."

. . . at the Press Club

Dixon pointed to the similarity between the MVGC contract with AEC and those with Electric Energy and Ohio Valley Electric Corp. On the question of cancellation, he noted that AEC's power needs might very well change in a few years.

"If the AEC power needs should diminish sharply, the government, whether acting directly or through the AEC or TVA, would have a very serious problem of disposing of such a large volume of electric power in an orderly way."

The contracts with EEI, OVEC and MVGC permit the government "to use the electric power as long as it needs it and not remain saddled with a permanent investment beyond that time," said Dixon.

Dixon then dealt with the charge of a guaranteed 9% return. He pointed out that construction cost had been estimated at $107 million; that the government would share a limited overrun on this amount but beyond a certain point the companies would take all the risk; that if costs exceeded the target by as much as 13%, the expected earnings would disappear.

Out of the annual power bill of $20 million, MVGC would have to pay all the regular utility costs and that if estimates were correct, it would receive $495,000 annually on its investment of $5.5 million.

"It is true that $495,000 is 9% of $5.5 million—but, as you can see, there is no guarantee of any kind that it will be earned," said Dixon. He noted that utilities last year earned an average 10.2% on their risk capital, which is the figure comparable to the 9%.

"Utilities, generally, need to earn 6% if they are to continue to raise the large amounts of capital required in the power business. Our return on the total capital in the project comparable to the 6% will be between 3¾% and 4% if all goes well."

. . . at PUAA

Dixon, addressing this meeting alone, dealt with many of the points covered on the television program and before the Press Club.

He said the utilities have been the victims of a "very clever and scurrilous attack." The opponents of the contract "have distorted this thing so much that I am sure the American people will come to see this for what it really is—a fine contract."

The Administration asked for help, and the utilities gave it, said Dixon. He also paid tribute to the President for sticking by his point of view through all the outcry. He complimented the President especially for his letter to Rep W. Sterling Cole, New York Republican and chairman of the Senate-House Atomic Energy Committee (EW Nov. 22 p 7).

Dixon also answered the criticisms that have been made about the utilities not speaking up in their defense. They felt, he said, that they could not do this since they had no contract. The contract with AEC did not evolve in its final form until a few hours before the signing, Dixon said.

MVGC Details Financing Plans

Dixon-Yates firm discloses at SEC hearing sources from which it expects to get capital for West Memphis plant

Mississippi Valley Generating Co, the new Dixon-Yates firm, went before the Securities and Exchange Commission last week to ask SEC approval of its financing arrangements and to question the right of public power groups to intervene.

In presenting their case, MVGC officials disclosed for the first time the sources from which they expect to obtain about $100 million in debt capital to build $107-million, 650,000-kw plant near West Memphis, Ark.

Interest Rate . . . One of the MVGC exhibits presented to SEC stated that cost of capital component in the base capacity charge to be paid by AEC was based on the expectation that the debt portion of the capital required for the plant could be obtained over a 30-year period at 3½% interest. But, the exhibit pointed out, indications already are overall interest rate will be somewhat higher than 3½%.

MVGC may, in the long run, borrow up to $120 million to finance its venture, depending on costs. Nevertheless, the new company formed by Middle South Utilities, Inc, and Southern Co, is basing its capital negotiations on a base figure of $107,250,000, from which it is deducting $1,135,000 for facilities to be provided by an associate company, $5.5 million of equity capital to be supplied by Mid-South and Southern, and an estimated $700,000 for interest during construction on equity. This leaves approximately $99 million of debt capital to be obtained.

Here is where MVGC expects to get most of its debt capital:

- $77,362,000 from insurance companies—$64,873,000 from Metropolitan Life Insurance Co, and $12,489,000 from New York Life Insurance Co. Loans will be in the form of 3⅝% first mortgage bonds, to be retired through a mandatory sinking fund in about 30 years after full-scale operation, starting with 11th year.
- $22,552,758 from banks—3¼% notes, to be retired through a mandatory repayment schedule in approximately ten years after full-scale operation. Chief lenders in this category would be: Chase National Bank, $8,118,993; Hanover Bank, $5,412,662; Irving Trust Co, $3,157,386; Guaranty Trust Co, New York Trust Co, and Chemical Corn Exchange Bank, $659,668 each. Eighteen other banks would invest less than $500,000 each.

The Hearings . . . The SEC hearings are concerned at this time only with the $5.5 million in equity financing by Mid-South and Southern. These two holding companies plan to split purchase of 55,000 shares of $100 par value common stock on a 79%-21% basis, with Mid-South owning the controlling interest. MVGC plans to return for additional SEC approval when matter of its debt financing comes up.

At the open hearing, Edgar H. Dixon, president of Mid-South and MVGC, presented a statement in favor of the application. Joseph Volpe, Jr, a member of a Washington law firm representing three dozen opponents of the contract, asked SEC to subpoena all documents of the two sponsoring firms. This was challenged as "a fishing expedition of the broadest kind I have ever seen" by Mid-South Attorney Daniel James. SEC reserved decision.

Question of Intervenors . . . Prior to the opening of the hearings, many public power groups had asked to be heard as intervenors. MVGC asked that SEC rule against their eligibility to be heard, and urged speed in approval of the stock issue. The commission agreed that speed is desirable, and sat in personally so as to expedite the hearings.

Co-op, Utility Heads Plan Power Needs

Allen S. King, president of Northern States Power Co, Andrew L. Freeman, manager of Minnkota Power Co-operative, and C. G. Wright, president of Otter Tail Power Co (l to r), were the moving forces behind the unique tri-state power conference at Grand Forks, N. Dak., recently.

Heads of the three sponsoring concerns pledged their continued cooperation and determination to keep ahead of the steadily growing demands for power in the area. For the past several years they have been operating large segments of their systems jointly.

King described the meeting as "the first of its kind in the country." Further praise came from REA Administrator Ancher Nelsen who said "the most significant development in rural electrification this year has been the growth of co-operation among power suppliers of several areas, in line with the excellent example which the three power suppliers in this area have set."

Tunnelling Machine Makes Its Bow at Oahe

A new 100-ton tunnelling machine is being used to gouge out six long tunnels at Oahe Dam, which is being constructed by Army Corps of Engineers near Pierre, S. D. The flood control and power project is part of the Missouri River flood control program.

This is the first reported attempt to apply "continuous mining" methods to a large-scale tunnelling operation. The Oahe project, which will be completed in 1961, requires eight miles of tunnels. Using conventional method of blasting and hand-mucking, tunnelling proceeds at a rate of one to two ft an hour. The new method is expected to make possible a rate of six to eight feet an hour.

Two Cutting Heads . . . On the circular front of the machine are two large cutting heads formed like the spokes of two wheels. At the end of each spoke are sets of cutting knives 10 in. long and spaced 10 in. apart. In back of the cutters are sets of tapered disk cutters.

The machine is mounted on rails and moved to a position opposite the section to be tunnelled out. Hydraulic jacks, which exert pressure up to 120 tons, force the cutting heads against the dirt and rock. Cutting wheels are set into motion by two 200 hp motors. The inner one spins in a clockwise direction and the outer one counterclockwise.

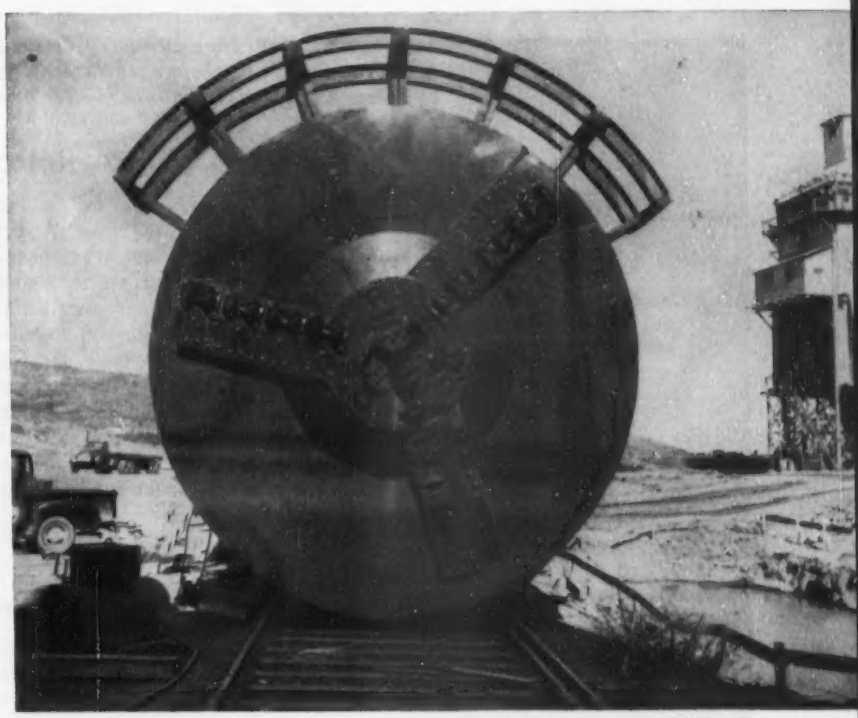
The earth is slashed with the knives on the two heads and the ridges between the slashings broken down by the tapered disk cutters. This causes the dirt and rock to fall to the floor where it is scooped up by six buckets attached to the outer cutting wheel and then dumped on to a conveyor device which carries the "muck" to trucks.

An overhead steel canopy and wooden siding cover the whole machine with the exception of the cutting heads, thus affording protection to workmen in the tunnel from fallen debris.

Dismantling Necessary . . . Because the machine cannot travel backwards, it will have to be disassembled and brought out when the tunnelling operation is completed.

The machine was constructed at a cost of more than $300,000 for Mittry Constructors, a Los Angeles firm handling the $9.5 million tunnelling job at Oahe for the Army Corps of Engineers.

Oahe Dam is scheduled for completion in 1961. Generating units under construction have a capacity of 170,000 kw. Ultimately, the project will have a capacity of 425,000 kw. Power produced at Oahe Dam will be marketed through the U. S. Bureau of Reclamation.



CUTTING WHEELS on the face of the tunnelling machine spin clockwise and counterclockwise

TUNNEL-MINING MACHINE is helping to speed work on Oahe Dam's six long tunnels

Nuclear Power Problems, Prospects

Philip Sporn sees outlook for atomic power dimmed by the major problems involved in its generation as well as by an advancing technology for conventional power

(Excerpts from an address by Philip Sporn, president, American Gas & Electric Co, before the Region 2 meeting of the Public Utilities Advertising Association held in New York City Dec. 1-2.)

'A Retrogression'

"Also under way are five different reactors designed as experimental developments along the road to competitive or economical atomic power. Only one of these—the Westinghouse-Duquesne pressurized water reactor project under construction at Shippingport, Pa., near Pittsburgh—can be termed a full-scale power plant. But this plant, too, is in a sense a retrogression in power production technology, for, though the milestone that it is, it will operate on a cycle and with an efficiency that were discarded in conventional plants 25 or 30 years ago." * * *

"There is promise, however, that both the capital cost and the operating costs of nuclear reactors can be reduced. This possibility seems to lie in the homogeneous reactor and in the fast breeder reactor. In the former, fabrication and reprocessing should be much simplified. In a breeder reactor, fuel cost can be reduced, theoretically at least, to an almost negligible point, thus permitting the low fuel cost to carry the burden of the high capital cost." * * *

The Problems

"Are there many problems? Yes—too many. Here are four of them . . . :

"Materials—The materials problem presented by a reactor core is an extremely tough challenge to the metallurgist; he must find a material that will stand up to intense radiation and corrosion and yet have the characteristic of low neutron absorption.

"Waste Disposal—The problem of disposing of atomic ash is a difficult one and, if the atomic power industry is to expand on an economical basis, new and cheaper methods of disposal must be found.

"Reprocessing—Discarding partly spent fuel material is unsound economically, except under special circumstances, so here, too, more economical means of reprocessing this material must be found.

"Hazard—Potentially, atomic reactors are hazardous. So, if competitive power is to be developed, methods of dealing with these hazards, involving engineering developments entirely new, will have to be developed." * * *

The Future

"In looking into the future of nuclear power, it must be emphasized that meanwhile we are not standing still in the art of conventional power generation. This fact is another to be remembered when judging whether and to what extent nuclear plants will be built in place of new conventional plants. In other words, nuclear development will always be competing with a constantly improving alternative.

"All of these economical and technical considerations make it certain that the enormous requirements for electric power in the next 15 years will be satisfied in the great majority by conventionally-fueled plants. It is also certain, however, that some atomic power plants will begin to be built in the next few years and small blocks of this capacity will begin to appear in some regions of the United States. Some, like Shippingport, will be purely experimental though of commercial size. Others will be barely competitive. It is obvious that, where competition is the decisive factor, atomic plants will appear first in the high fuel cost areas or perhaps in locations of assured high load factors.

"All told, in the next five years it is doubtful if more than 500,000 kw of nuclear generating capacity will exist; in the next ten years or so, 3-million kw —compared with total requirements of 200-million kw; and by 1970, perhaps 10-million kw—compared with close to a total of 275-million kw." * * *

Atomic Energy ...

. . . will be fueling 50% of new electric power plants by 1976, says GE's Ralph Cordiner

Fifty per cent of new electric power installations will be atomic in about 20 years. This is the forecast of Ralph J. Cordiner, president of the General Electric Co, made to the recent National Association of Manufacturers Congress of Industry.

Urging industry to avoid "creeping conservatism," he asked "are we going to have the imagination, the foresight, and the long-range plans necessary to convert atomic fission from our major source of fear into one of our major sources of fuel energy in the next century?"

Cordiner added "if private industry is given the opportunity to proceed with the development of atomic power, it is our optimistic estimate that by 1976, 50% of new electric power installations will be atomic. This does not mean we underestimate the role of conventional fuels. The world will continue to use coal, gas, and oil in ever-increasing quantities."

Automation Should Be Welcomed . . . Cordiner also referred to the trend to automation. Too often, he said, the automatic factory is "spoke of in fear, as if we were planning to make men the slaves of machines. The opposite is true." He noted that the electrical manufacturing industry alone expects to double production in the next ten years. "And yet we also know that the available work force will increase only 11% by 1964," he said.

The GE president appealed for a broadened base of ownership in American enterprise. "The need is two-fold: to gain increased understanding through the participation of ownership and to fulfill the tremendous demands for capital investment. Capital expenditures are expected to increase to $55 billion annually in the next decade. The new capital requirements of the atomic age will be even greater. The alternative is to leave the job to the government," he stated.

Cordiner warned of a shortage of manpower. In view of the growing population, he said, it might seem a paradox to suggest that our greatest potential shortage may be people—people with "managerial ability, more specialists of every kind, more technicians, and much better educated employees at every level." The need "for more engineers is urgent," said Cordiner.

Noting that too many businesses are managed on a year-to-year basis, he proposed that the conventional period of planning should be "the business generation—a period of from 15 to 20 years."

John Jay Hopkins, chairman and president, General Dynamics Corp, also addressed the meeting, proposing an "Atomic Marshall Plan."

"I propose that there be initiated now a 100-year program for the financing, construction, and implantation of atomic reactors in the power-short, food-short, water-short, life-short areas of the world by American private enterprise and the American government working together with friendly national governments and their own private enterprise groups," he said.

Atomic Forum Establishes Reactor Materials Group

Atomic Industrial Forum has established an industrial Nuclear Reactor Materials Committee.

Companies cooperating in the organization of the committee are Allegheny Ludlum Steel Corp, Aluminum Co of America, Babcock & Wilcox Co, Climax Molybdenum Co, International Nickel Co, Lukens Steel Co, Nuclear Metals, Inc, Republic Steel Corp, Titanium Metals Corp, and Vanadium Corp of America.

Marcel A. Cordovi, Babcock & Wilcox and chairman pro tem of the committee, said the group is expected to survey the adequacy of materials research in the nuclear power field, promote publication and dissemination of existing and new data and initiate and sponsor research.

The Nuclear Reactor Materials Committee is the first of a number of committees which the forum expects to establish.

Bearspaw Dam Boosts Canada's Output

Newest in Calgary Power Co's chain of hydroelectric projects, the $5.5-million Bearspaw Dam and powerhouse (shown above) added 16,000 kw to the company's generating capacity last month. Picture shows the spillway section, the powerhouse, and the rolled-core dam to the right and on the north side of the Bow River bed. Bearspaw, located 12 miles west of Calgary, is about 56 ft high and 1,300 ft long at the crest.

Bearspaw is one of a number of projects underway or scheduled by Calgary Power and other companies, that will add 468,000 kw to Alberta's present 362,000-kw capacity. Largest of the scheduled projects is Calgary Power's $8-million steam plant under construction at Lake Wabamun, 40 miles west of Edmonton. It will have an ultimate capacity of 320,000 kw.

Right-of-Way Ruling

Mississippi court holds co-op can be made liable for lowering property value on highway

Mississippi Supreme Court ruled in a 5-to-4 decision that Southern Pine Electric Power Association can be made liable for lowering the value of abutting property along its power lines on a highway right of way.

The decision reversed a ruling by the Jefferson Davis County chancery court which had dismissed a damage suit brought by the property owner, H. L. Berry. The state court ordered the case tried on the question of actual damages to Berry's property.

It is expected a suggestion of error will be filed which is equivalent to an application for a rehearing of the case.

The decision, should it stand, is a far-reaching one which would affect all utility companies in the state.

Claims Property Damage . . . Berry initiated the court action by claiming the piece of land he owns on Highway 13 in Jefferson Davis county was lowered in value from $12,000 to $10,000 as a result of the construction of a transmission line by electric association along the highway right of way directly in front of his property.

Berry had sold and conveyed the right of way to the Mississippi State Highway Commission in 1939. The electric association constructed the power lines in 1951 over the written protests of Berry but with permission of the highway commission.

Constitutional Right . . . The majority opinion held that although the highway commission has, under state law, jurisdiction over location and construction of electric lines, the commission does not have the authority "to grant to telephone, oil, and gas pipe lines, and to electric power lines, the use of the highway right of way for the purpose of constructing their poles and telephone and electric power lines or gas pipe lines, without regard to the constitutional right of an abutting landowner to recover damages where his private property may have been damaged for such public use."

The dissenting opinion held that no point of constitutional law was involved and that the matter was covered by statutes providing no additional compensation for easement to locate electric power lines.

The minority contended that when Berry conveyed the right of way in front of his property to the highway commission, he removed the property from any constitutional protection.

Minority said land owner would have a right for action only by "any reasonable interference resulting in special or peculiar injury to his property . . . differing in kind from inconvenience or undesirability of existence of such poles and lines."

GE's Oldest Operating Transformer

"Transformer Treasure Hunt" conducted by the Power Transformer Department of General Electric Co has turned up the company's oldest operating medium-size unit. The 52-year old transformer is shown above in a Pacific Gas & Electric Co substation at Davenport, Calif. Showing the transformer is Harold Sutcliffe, PG&E general superintendent of substations.

In conducting the three-month, nationwide search, the GE department offered to replace the oldest unit found with a modern transformer manufactured at its new Rome, Ga., plant. There were 209 old transformers submitted by 121 utilities and other power transformer users.

Purchased by California Gas & Electric Co, PG&E predecessor, the unit was first installed in Oakland, Calif., then moved to Napa, Calif., in 1910. In 1915, it was moved to its present site. The old unit, rated in kilowatts, has a capacity of 1,100 kw and a voltage rating of 2566/30,800 v.

REA Integration Contract . . .

. . . between Kentucky co-op and utility firm is brewing into controversy with possibility of Congressional investigation

There's a touchy situation developing in Washington over a ten-year integration contract between East Kentucky Rural Electric Cooperative Corp and the Kentucky Utilities Co. No one wants to talk about it, but there's a chance of a red-hot controversy brewing.

The contract, negotiated last year, calls for integration of the two systems. Rural Electrification Administration, which has a lot of cash tied up in the co-op's facilities, feels it is a good contract, and that it will save the co-op and its farmer customers money.

Restrictions . . . There are several restrictive clauses in the contract which spark the argument. One of these, according to public power advocates who have studied the contract, prohibits the co-op from integrating its system with that of any utility other than Kentucky Utilities. Another prevents the co-op from picking up any new industrial loads in the vicinity, reserving this business to the utility company.

National Rural Electric Cooperative Association does not think the contract is a good one, because of these restrictions. It fears a trend. The co-op, which is an NRECA member, feels it has a good contract, and, in an open letter to Columnist Robert S. Allen—who had blasted the restrictions—East Kentucky Pres Alex B. Veech said so. Veech indicated the co-op had no alternative, because of economic considerations.

NRECA does not wish to argue publicly with one of its members, but there is a side issue rankling NRECA Pres Clyde Ellis which may bring the fight out into the open.

Ellis' Position . . . Ellis was called in to review the contract when negotiations were underway last year. Because of the restrictions referring to the co-op's load growth, Ellis refused to give unqualified endorsement to the agreement, according to public power sources. On the other hand, those sources say, REA Administrator Nelsen wrote a memorandum to his deputy, Fred Strong, following the East Kentucky - Kentucky - NRECA - REA meeting, which indicated Ellis had expressed approval of the pact.

Whether rural Congressmen will take action at the forthcoming session remains to be seen. But even if they do not investigate this contract directly, or schedule hearings specifically on this question, chances are at least even that the restrictive provisions of the agreement will come in for some heated discussion when Administrator Nelsen presents his fiscal 1956 program for Congressional approval.

Labor Leaders Are Guilty of Joppa Plant Extortion

Two labor leaders charged with a $1,030,000 shakedown to insure labor peace on the $197-million Joppa, Ill., power plant project of Electric Energy, Inc, were found guilty last week in the U. S. District Court in East St. Louis, Ill.

Evan R. Dale, head of the AFL Common Laborers Union in southern Illinois, and James Bateman, business agent of the Murphysboro, Ill., AFL pipefitters union local, were guilty of conspiracy and attempt to extort $1,030,000 from Ebasco Services, Inc, and EEI. Dale was found guilty alone on extorting $7,500 from Maxon Construction Co, Dayton, Ohio, a subcontractor for Ebasco.

During the trial the government contended that failure to pay the money was followed by more than 18 months of labor unrest at the Joppa project.

EEI, which consists of five utilities, built the Joppa plant to supply power to Atomic Energy Commission's plant at Paducah, Ky. Ebasco Services was prime contractor on the construction job at the time of the extortion in 1951.

Senate Confirms Libby as AEC Commissioner

The Senate has confirmed without objection the nomination of Dr Willard Frank Libby to be a member of the Atomic Energy Commission. Libby was appointed to an interim term to fill the vacancy created when Dr Henry D. Smyth resigned. The new commissioner, 46, was a member of the University of Chicago's Institute for Nuclear Studies and the AEC's advisory committee before his appointment.

His confirmation was delayed when Sen Estes Kefauver (D-Tenn.) objected on the grounds that Libby approved of the controversial Dixon-Yates power contract. Kefauver later withdrew this objection, and the confirmation went through by a unanimous vote.

MEETINGS CALENDAR

***EDISON ELECTRIC INSTITUTE**

Industrial Relations Committee, EEI Headquarters, New York, Dec. 16; Industrial Relations Committee, EEI Headquarters, New York, Jan. 20; Prime Movers Committee, Grand Hotel, Mobile, Ala., Jan. 31-Feb. 1; Home Service Committee, Washington, D. C., Feb. 4-5; Accident Prevention Committee, Shoreham Hotel, Washington, D. C., Feb. 9-10; Transmission and Distribution Committee, Shoreham Hotel, Washington, D. C., Feb. 10-11; Industrial Relations Committee in conjunction with AGA at AMA Mid-Winter Personnel Conference, Palmer House, Chicago, Feb. 14; Electrical Equipment Committee, Deshler Hilton Hotel, Columbus, Ohio, Feb. 14-15; Commercial Electric Space Heating and Air Conditioning Committee, St. Louis, Feb. 17-18; Residential Promotion Committee, New York, Feb. 17-18; Accounting Conference, Planning Edgewater Beach Hotel, Chicago, Feb. 17-18; 1st Street Tree and Utility Conference, co-sponsored with EEI Transmission and Distribution Committee and Street Lighting Committee of Illuminating Engineering Society, Wade Park Manor, Cleveland, March 3-5; Industrial Relations Committee, EEI Headquarters, New York, March 17, 1955.

NORTHEASTERN WEED CONTROL CONFERENCE

Annual Meeting, New Yorker Hotel, New York, Jan. 5-7, 1955.

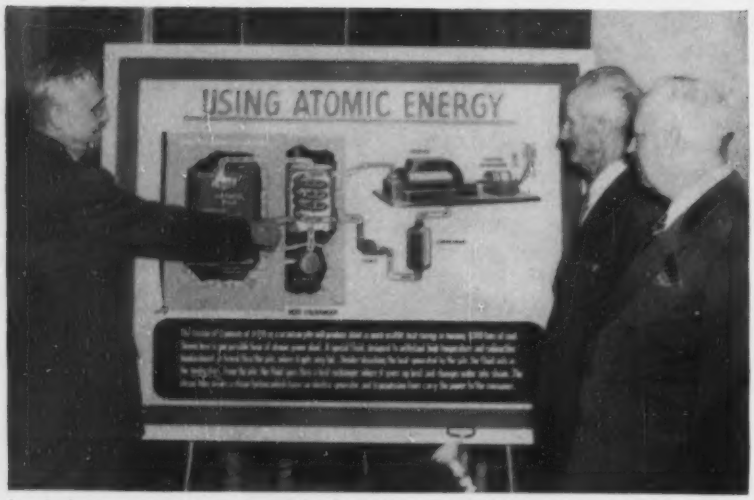
ELECTRICAL EQUIPMENT REPRESENTATIVES ASSOCIATION

Annual Meeting, Breakers, Palm Beach, Fla., Jan. 10-12, 1955.

NATIONAL ASSOCIATION OF PURCHASING AGENTS

Third Region, Jefferson Hotel, St. Louis, Jan. 13-14; 24th Annual Mid-Winter Conference, Public Utility Buyers' Group, Shamrock Hotel, Houston, Tex., Feb. 13-15, 1955.

(*Continued on page* 204)



Local shareowner meetings give Idaho Power Pres. T. E. Roach the opportunity to discuss nuclear power potential with Shareholders Byrd Trego and A. L. Merrill at Pocatello.

Local Shareowner Meetings

Idaho Power Co manages to get closer to the people who have a stake in the utility by holding a number of shareowner meetings throughout the service area rather than a large meeting in a central location. At four local meetings during one week this fall Pres T. E. Roach discussed company operations and plans with 1,200 owners, the largest number ever to attend the meetings and a 28% increase over last year.

In his report Roach said that although taxes are at a record high, 34% of gross revenue, nothing short of a catastrophe could upset the excellent financial position of the company. He predicted that Idaho Power would almost triple in size within ten years.

In a breakdown of ownership of the company, Roach said there are "10,438 shareowners, 93% of whom are individuals. The balance are institutional owners, such as life insurance companies which have 133,000 policy holders in our service area. Of the total voting power of company ownership, 58% is in the west, with no single owner having more than about 2%. Idaho shareowners are double the number of owners in any other state. Of all preferred shareowners, 78% are residents of Idaho and Oregon, and 67% of our employes are shareowners."

To dramatize the discussion, Roach used displays covering distribution of ownership, a breakdown of how tax money was spent, the potential of atomic power plants, and Light's Diamond Jubilee. In his letter to shareowners, Roach urged each owner to bring guests and offered local transportation to and from the meeting. light refreshments were served at each meeting.

'You Are There' Titles

Electric Companies Advertising Program continues sponsorship of the popular TV film series, "You Are There" during 1955.

Shows scheduled through January are as follows:

Jan. 2—"The Torment of Beethoven."

Jan. 9—"The Death of Stonewall Jackson."

Jan. 16—"The First Flight of the Wright Brothers."

Jan. 23—"Susan B. Anthony is Tried for Voting."

Jan. 30—"The Tragedy of John Milton."

Pamphlet Describes CEI Speakers Bureau Talks

Cleveland Electric Illuminating Co has sent pamphlets to civic, social and other organizations in its service area describing the activities of the company speakers bureau.

Some 26 subjects and 14 films are on tap for presentation by the bureau, which draws on 68 employee speakers.

Speech subjects were chosen on the basis of past public reception, anticipated general interest to varied groups, and value to the Company. The talks and films are described in the brochure which was mailed to 420 schools and 1580 program chairman of organizations throughout the Cleveland-Northeast Ohio area.

Response to the bureau during the 1954-55 season is expected to run well ahead of last year when company employees presented talks before some 320 organizations with an audience totalling 44,130.

SCANNING THE ADS

Alabama Power Co—Ad showing family entering new home warns "Before buying a home, have the wiring checked." Its the company way of pushing adequate wiring.

The Connecticut Light and Power Co—Large drawing of a lion is captioned "What's a lion doing at CL&P?" Answer is that many CL&P employees belong to the Lions Club and other service and civic groups. It is one way of being a good neighbor.

Public Service Electric and Gas of N. J.—Plugs its "Charmed Circle" area development program with an ad picturing a dog burying a bone with caption "Diggin's fun . . . and easily done" in the New Jersey area served by the company.

Wisconsin Public Service Corp—A series of ads describing light as "a thrill", "festivity", "drama" and "joy." Dramatic pictures of circus acts, Christmas lighting, and night parades illustrate the series.

Georgia PSC Order Reversed

The Supreme Court of Georgia rules in its summation that 'Public management must not supplant private management'

HARLLEE BRANCH, JR

J. W. LASTINGER

The Supreme Court of Georgia has reversed an order of the Georgia Public Service Commission which would have required, among other things, for Georgia Power Co to show why it should not sell to Georgia Power & Light Co its total power requirements at rates equal to those under which Georgia Power serves co-operatives and municipalities. Harllee Branch, Jr, is president of Georgia Power and J. W. Lastinger is president of Georgia P&L.

In addition, it would have required both companies to show cause why PSC should not file with Securities and Exchange Commission a petition for the Georgia P&L's parent, Florida Power Corp, to divest itself of its affiliate in Georgia and sell it at a fair price to Georgia Power Co. Finally, if the Georgia P&L were unwilling or unable to do any of the foregoing why the PSC should not reduce the Georgia P&L's rates to the same levels charged by the Georgia Power Co.

PSC's Jurisdiction Questioned . . . The court, after reciting the foregoing facts, went on to say: "The first question presented for our determination is whether the commission has jurisdiction and legal authority to force the Georgia Power Co, against its will, to buy or merge with a separate and distinct neighboring electric public utility, or to sell power to such other utility company, although the Power Company has never undertaken as a public utility to provide such service. The Georgia Public Service Commission has only such powers as the legislature has expressly, or by fair implication, conferred upon it."

The court continued: "We find no Georgia statute which confers upon the Georgia Public Service Commission authority to require one public utility to buy or merge with another, or to sell or not to sell power to each other. The general rule, as stated in 43 American Jurisprudence, p 588, g 22, is as follows: 'To require a public utility to devote its property to a service which it has never professed to render or to the service of a territory which it has never undertaken to serve is tantamount to taking that property for public use without just compensation.' "

"It also seems to be a well settled rule that public utilities have the right to enter into contracts between themselves, or with others, free from control or supervision of the State, so long as such contracts are not unconscionable or oppressive and do not impair the obligation of the utility to discharge its public duties."

The court mentioned a decision of the Supreme Court of North Carolina which said " 'It is stated in 51 C.J., p 8, Sec. (19) F, "The fact that a business or enterprise is, generally speaking, a public utility, does not make every service performed or rendered by it a public service, but it may act in a private capacity as distinguished from its public capacity, and in so doing is subject to the same rules as a private person.' "

With regard to the sale of power by the Georgia Power Co to the Georgia P&L, the court said: "For the commission to order the Power Company to sell the Light Company its power requirements, even if it should appear that it had the available capacity, would be for the commission to usurp the functions and prerogatives of the Power Company, and this it cannot do, for, as was held by this court in Southern Bell Telephone and Telegraphy Co. v. Georgia Public Service Commission, 203 Ga. 832, 878 (49 S. E. 2d 38): 'The commissioners are not the managers of this company, but their function is to regulate and disapprove any dishonest or clearly inefficient conduct and practice by the utility. Public regulation must not supplant private management.' "

Summation . . . The court said: "1. The Georgia Public Service Commission has only such powers as the legislature has expressly, or by fair implication, conferred upon it, and there is no statute conferring upon it the power to require an electric public utility, against its will, to buy or merge with a separate and distinct neighboring electric public utility, or to sell power to such other public utility where it has never undertaken as such public utility to provide such service. 'Public regulation must not supplant private management.'; 2. Injunction is an available remedy to restrain the Georgia Public Service Commission from acts or threatened acts which are beyond the scope of its jurisdiction and authority; 3. The petition stated a cause of action, and the trial court erred in sustaining the general demurrer thereto."

FINANCIAL BRIEFS

Black Hills Power & Light Co has sold 9,950 shares of 4.75% $100 par value cumulative preferred stock to two institutions at $100 per share.

Louisiana Power & Light Co has formed a subsidiary, Louisiana Gas Service Corp, and subject to regulatory approvals, will transfer all its gas and water properties to the new company.

Central Hudson Gas & Electric Corp has sold privately through Kidder, Peabody & Co, $11 million first mortgage bonds 3.20% due 1984 and 60,000 shares of 4.35% cumulative $100 par preferred stock.

Mississippi Power & Light Co has awarded to a White, Weld & Co and Kidder, Peabody & Co group the underwriting of its 44,476 shares offering in exchange for outstanding $6 preferred stock on a share-for-share basis. The winning bid specified an underwriting compensation of 47.7¢ a share.

California Oregon Power Co has asked California Public Utilities Commission approval of a plan to issue 129,865 shares of common and offer them to 7% preferred holders on the basis of five shares of common for each share of preferred. Another 34,289 common shares would be issued and offered in exchange for the 6% preferred on a 4.4-for-1 basis.

Increased Quarterly Common Dividends . . . Duke Power Co will pay Dec. 21 a regular dividend of 40¢ a share plus an extra 40¢, bringing the total in 1954 to $2 a share as compared with $1.77½ in 1953 . . . Montana-Dakota Utilities Co will pay Jan. 1 a 25¢ a share dividend versus 22½¢ previously . . . Green Mountain Power Corp will pay Jan. 3 a 45¢ a share dividend as compared with 37½¢ in previous quarter . . . Duquesne Light Co will pay Jan. 1 a 45¢ a share dividend versus 43¢ in the two previous quarters.

Southwestern Public Service Co has prepared a booklet for security analysts. For copy, write: H. L. Nichols, chairman, Dallas, Tex.

Today in Utility Finance

YIELDS (%)

	Bonds			Preferred Stocks			Common Stocks		
Quality	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
Dec. 2	**2.98**	**2.91**	**3.10**	**3.86**	**4.03**	**4.37**	**4.41**	**4.80**	**5.25**
Nov. 24	2.88	2.91	3.08	3.87	4.02	4.37	4.45	4.80	5.19
END OF QTR.									
3rd 1954	2.88	2.90	3.10	3.89	3.99	4.38	4.50	4.80	5.19
2nd 1954	2.90	2.96	3.19	4.03	4.14	4.48	4.72	5.04	5.45
1st 1954	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
4th 1953	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months	Ended	Net Income 1954	Net Income 1953	Earnings per common share 1954	Earnings per common share 1953
Dallas Power & Light	12	Oct.	$5,800,683(a)	$4,699,880(a)	$....	$....
Dayton Power & Light	12	Sept.	7,437,431(b)	6,996,094(b)	....	....
Gulf States Utilities	12	Oct.	9,786,291	9,122,845	1.95	1.80
Louisiana Power & Light	12	Oct.	4,094,369	3,554,288	....	....
Pacific Gas & Electric	12	Sept.	61,211,648	58,305,549	2.83(c)	3.12(c)
Pennsylvania Power & Light	12	Oct.	19,559,404	17,070,583	2.88	2.78
Public Service Co of Colorado	12	Sept.	8,000,708	7,836,860	2.38	2.36
Public Service Co of Indiana	12	Oct	12,093,834	11,631,295	2.35	2.34
Public Service Co of New Mexico	12	Sep	1,514,976	1,197,664	0.88	0.81
Quebec Power	9	Sept	717,664	616,871	....	....
Texas Electric Service	12	Oct.	10,190,547	8,947,143	....	....
Texas Power & Light	12	Oct.	10,206,909	9,037,606	....	....
Virginia Electric & Power	12	Oct.	15,903,261	12,693,993	2.27(f)	1.92(f)
West Penn Electric, consolidated	12	Oct.	15,561,159	14,472,608	3.68	3.42

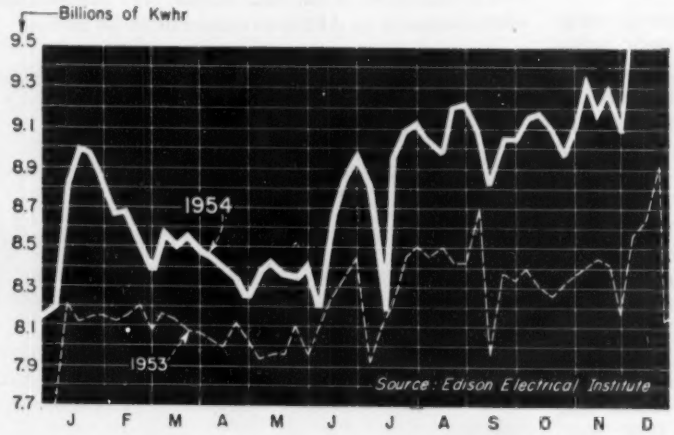
Notes—(a) After transferring $228,200 in 1954 and $398,159 in 1953 to surplus reserve as provided for in the franchise from the city of Dallas; (b) Earnings on common stock; (c) Based on average number of shares outstanding; and (f) Based on 5,999,980 shares in 1954 and 5,441,034 shares in 1953.

FINANCING

Company and Description	Amount of Offering ($000)	Offering Price	Yield to Public
WEEK OF DECEMBER 2-8			
Bonds			
Long Island Lighting—1st mtg 3¼% due 1984	$15,000	102.915%	3.10%
Preferred Stock			
Central Power & Light—75,000 sh 4.20% $100 par cum.	$7,500	$101.75	4.128%
SCHEDULE FOR NOVEMBER-DECEMBER-JANUARY-FEBRUARY			
Bonds and Debentures			**Bid Date**
New Orleans Public Service—1st mtg due 1984	$6,000	.....	Dec. 14
Puerto Rico Water Resources Authority—electric revenues due 1957-90	12,500	.....	Dec. 14
New York State Power Authority—revenues	315,000	.....	Dec. 15(a)
Duke Power—1st mtg due 1975	40,000	.....	Jan. 10
Commonwealth Edison—conv. debs	50,000*	.....	Jan. 11
New England Power—1st mtg due 1985	25,000	.....	Jan. 18
Los Angeles, Calif., Department of Water & Power—electric plant revenues	18,000	.....	Jan. 26
Kansas City Power & Light—1st mtg due 1985	15,000	.....	Feb. 15
Western Light & Telephone—1st mtg due 1985	3,000	.....	.....
Preferred Stock			
Patchogue Electric Light—750 sh $1,000 par	$750	.....	.....
Public Service Electric & Gas—250,000 sh $100 par cum.	25,000	.....	Jan. 11
Common Stock			
Duke Power—218,737 sh (to be offered commonholders on 1-for-20 basis, record Jan. 12 to expire Jan. 28; no underwriting)	$8,749	$40.00	5.00%
Western Light & Telephone—about 40,000 sh (to be offered commonholders on a 1-for-10 basis)	.....	.....	.....
ISSUES RECENTLY POSTPONED			
Bonds			
Gulf States Utilities—1st mtg due 1984	$24,000	.....	.....
Consolidated Edison Co of N. Y.—1st mtg due 1984	50,000	.....	.....
Preferred Stock			
Gulf States Utilities—160,000 sh $100 par cum.	$16,000	.....	.....
UNSCHEDULED AND/OR UNDER CONSIDERATION			
Bonds and Debentures			
Kentucky Utilities—1st mtg	$15,000	.....	.....
Southern Nevada Power—1st mtg	5,400	.....	.....
Southern Nevada Power—debs	1,000	.....	.....
Preferred Stock			
Public Service Co of Oklahoma—100,000 sh $100 par	$10,000	.....	.....
Southwestern Gas & Electric—60,000 sh $100 par	6,000	.....	June 1
Common Stock			
Kentucky Utilities—about 228,678 sh (to be offered commonholders on about 1-for-10 basis)	.....	.....	.....

Notes—* Estimated; (a) Dillon, Read & Co group, underwriters.

STATISTICS



Output Week Ended Dec. 4—9,612,000,000 Kwhr

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Dec. 4	+12.0	+7.2	+5.0	+8.5	+2.6	+23.9	+10.1	+8.8	+9.9	+10.9
Nov. 27	+11.7	+5.4	+5.3	+9.4	+3.1	+23.3	+11.1	+7.5	+5.6	+8.9
Nov. 20	+10.7	+3.6	+4.9	+8.5	+3.5	+21.7	+10.5	+6.3	+5.8	+7.0

Seasonally Adjusted Index †177.0 Week Ago 174.9** Year Ago 158.2

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load ‡(Million Kw)	Sept.	79.4	79.7	74.4
Capacity (Million Kw)	Oct.	100.01	99.16	88.62
Production (Billion Kwhr)	Sept.	39.55	41.17	37.03
Hydro	Sept.	7.80	8.34	7.59
Fuel	Sept.	31.74	32.82	29.44
Fuel Consumption:				
Coal (Million Tons)	Sept.	9.73	9.83	9.67
Oil (Million Barrels)	Sept.	4.90	4.85	6.16
Gas (Billion Cu Ft)	Sept.	118.62	130.49	105.14
Sales (Billion Kwhr)	Sept.	34.05	33.88	32.64
Residential	Sept.	9.76	9.65	8.55
Commercial	Sept.	6.69	6.66	5.90
Industrial	Sept.	15.00	14.89	15.67
Other	Sept.	2.60	2.68	2.51
Net Income Class A & B Companies ($ Million)	Sept.	92.41	89.43	80.66
Estimated Dec. '54 Peak ‡(Million Kw)	Sept.	87.8	88.0	91.2
Kwhr per Residential Customer (12 Month Average)	Sept.	2,496	2,476	2,302
Revenue per Kwhr Residential Service (12 Month Average)	Sept.	2.70¢	2.71¢	2.75¢
Canadian Production (Billion Kwhr)	Sept.	5.51	5.45	5.09

Business Statistics

FRB Industrial Production Index†	Oct.	129	126	136
Gross National Product Annual Rate ($ Billion)	3rd Qtr.	355.5	356.0	367.2
EW 4 Industry Production Index†	Oct.	116.6	116.0	124.0
ENR Construction Cost Index††	Nov.	134.8	134.6	128.1
BLS Consumer's Price Index	Oct.	114.5	114.7	115.4
NEMA Insulation Materials Sales Index†	Sept.	123	111	153
NEMA Electric Appliance Sales Index†	Sept.	115	91	102
NEMA Household Refrig. Sales Index†	Sept.	73	71	62
Metal Prices (Dec. 7)				
Copper, Conn. V., lb		30.0¢	29.7¢	29.7¢
Lead, N. Y., lb		15.0¢	15.0¢	13.5¢
Zinc, prime Western E. St. Louis, lb		11.5¢	11.5¢	10.0¢
Tin, Straits, qual. N. Y., lb		90.0¢	91.5¢	84.3¢
Aluminum, ingot, base price		22.2¢	22.2¢	21.5¢
Nickel, base price		64.5¢	60.0¢	60.0¢
Steel, billets, Pitts., ton		$64.00	$64.00	$62.00
Steel, scrap, No. 1 heavy, Pitts., ton		$32.00	$32.00	$35.00

*Preliminary **Revised ‡Class 1 Systems †1947-49=100 ††1949=100

Business: Stability Now Maybe Rising Next Year

Appraising the third quarter of this year seems to indicate that "the melody is still lingering on". That is, the three principal features that have marked the year so far persisted into the third quarter: reduction in government outlays for national security; liquidation in business inventories; and growth in civilian buying both of goods and services. The first two factors in that amounted to a reduction of $3½ billion at seasonally adjusted annual rates, but again were offset by the net increase in the third factor: civilian purchases rose by about $4 billion at annual rates.

Total production during the quarter at $355.5 billion showed very little variation from the preceding two quarters. This is about 4% or $14 billion below the peak second quarter of 1953, and between $9 and $10 billion higher than the 1952 annual total.

	Third Qtr 1954
Gross national product	$355.5
Personal consumption expenditures	234.8
Durable goods	28.9
Nondurable goods	121.1
Services	84.8
Domestic fixed investment	45.3
New construction	28.3
Residential nonfarm	14.0
Other	14.2
Producers' durable equipment	21.8
Change in business inventories	–4.8
Net Foreign investment	–.2
Government purchases	75.6
Federal	47.9
National security	42.1
Other	6.1
Less: Gov't sales	.2
State and local	27.7

Source: U. S. Dep't of Commerce

That the "song may not be endless" however, is suggested by some more recent developments. A slackening in the rate of inventory liquidation, especially in primary metals and machinery, associated with the step-up in steel activity and electrical machinery production; an even higher rate of consumer spending in a large proportion of total expenditures—in construction, nondurables and services, point to a possibility of a new trend up for next year.

WASHINGTON COMMENT

There's a trend developing in the field of atomic energy which should make utilities and the American public happy. Utilities are playing a key role in this development.

Competition Now Enters the Field of Atomic Power

Stated simply, it boils down to: Competition is beginning to make itself felt. The controlling hand of the government is relaxing its grip on the atom.

Several important recent developments point to this:

- Utilities, the biggest potential market for large scale atomic power reactors, are urging their traditional commercial heavy electrical apparatus suppliers to dig in and get commercially feasible nuclear reactors out of the laboratory and ready for production.
- In at least one case a large manufacturer is pushing hard to get a group of utilities interested in a reactor that holds promise of economic power production (EW, Nov. 8, p 10).
- Fifty-five per cent of companies solicited (18 out of 33) submitted bids for construction of the Army Engineers' package atomic power plant to be built at Fort Belvoir, Va.

Many informal industry-government talks in Washington recently have resulted in utilities men being referred back to their traditional suppliers when they asked for help in getting a reactor development program going on a commercial basis. The Atomic Energy Commission, under the Republicans, feels the less it does, the more private industry must do on its own, now that several experiments to prove the economic feasibility of atomic reactors are off the ground.

Industry Moves In . . . The utilities are following up by asking suppliers to sharpen their estimates to get costs down to a reasonable level. The utilities feel, as does AEC, that every important electrical equipment maker has up his sleeve, or is reaching for, a particular reactor design the supplier thinks is workable.

This is a situation made to order for the manufacturers, and there is every indication that they are pushing toward the goal as fast as is feasible. Every major manufacturer already has one or more nuclear power projects underway looking toward the economic production of power. Effort is being made to anticipate the demands of the utilities.

AEC is counting heavily that this greater reliance on private industry will bring atomic power into being a lot faster than would otherwise be the case. That was one of the big arguments for revamping the Atomic Energy Act earlier this year. These first indications of interest and competition lend validity to the argument.

This does not mean that competition has licked or can immediately lick all the technical and economic problems connected with producing electric power from the atom. The situation does not put feasible power from this source right around the corner. What it does do is to create more incentive for the various segments of the industry to push toward economic nuclear power.

AEC officials are happy to have the support of utilities in pushing toward this end. Their confidence was bolstered several weeks ago when the bidding on the package reactor came out so successfully. A large proportion of the solicited firms showed they think they can build a piece of atomic equipment still in the planning-board stage—and do so on a competitive bases. What is even more important the price spread of the bids as a whole was, in the words of one AEC official, "not unsatisfactory" when compared to AEC's own estimate of $4 million.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Eiffel Tower has an aluminum-sheathed coaxial television cable 6⅛ in. in diameter. Vertical length is about 1,000 ft.

Interconnection agreements save production plant outlay for relatively small participants because they permit installation of larger and more economical plants than otherwise feasible.

Transmission performance of a proposed carrier channel should always be measured before actually placing a carrier system in service (AIEE committee).

Germanium for transistors is now so completely purified by Bell Telephone Laboratories that there is only one atom of impurity in ten billion atoms of germanium.

Alleviation of transmission line conductor galloping can be achieved by melting the ice coating with heavy current, absorbing and dissipating the kinetic energy by use of dampers, or changing the natural frequencies of the spans in some way.

Over-refinement of transformer oils results in corrosive acids that react with copper and iron to form metallic soaps that are capable of holding water in suspension.

Established engineers in the electric utility industry, "highly individualistic and resisting union regimentation, have not received adequate recognition and may become the forgotten men of the industry" (J. E. Hobson and W. A. Lewis).

Low intensity radioactivity is effective in controlling the firing voltage of voltage regulator tubes and for the ionization of spark gaps.

One thousand acre feet of water at 1,000 ft above sea level represents a potentiality of over 1,000,000 kwhr.

Borax is reported as a cheap and effective way of removing protective coating material from a new deaerating heater. Solution of 0.3% did the job in a 3-day soaking.

Race and balls of the bearing of an air break switch may be damaged if flashover occurs and the ground current flows through the bearing on the rotating insulator.

Isotope-activated luminous compounds offer adequate and useful safety marking for spots where power failure may disrupt normal operations and guidance markings for personnel are required.

Wake Up to the Market Down on the Farm

A special 36-page section showcasing the vast sales and loadbuilding opportunities to be found in the most overlooked and richest potential market of all: the American Farm. In this farm package you will find:

GROWTH – Ten graphs which lay before you the 10-year growth of the farm market nationally and in the country's nine geographical regions. They provide a statistical basis on which to judge for yourself what has been done and can be done to tap the rural market . . . . . pages 104 to 113

APPLICATIONS – Stories of what 28 progressive "high-use" farm customers are doing RIGHT NOW with electricity to build profits and ease their burdens . . . . . pages 114 to 133

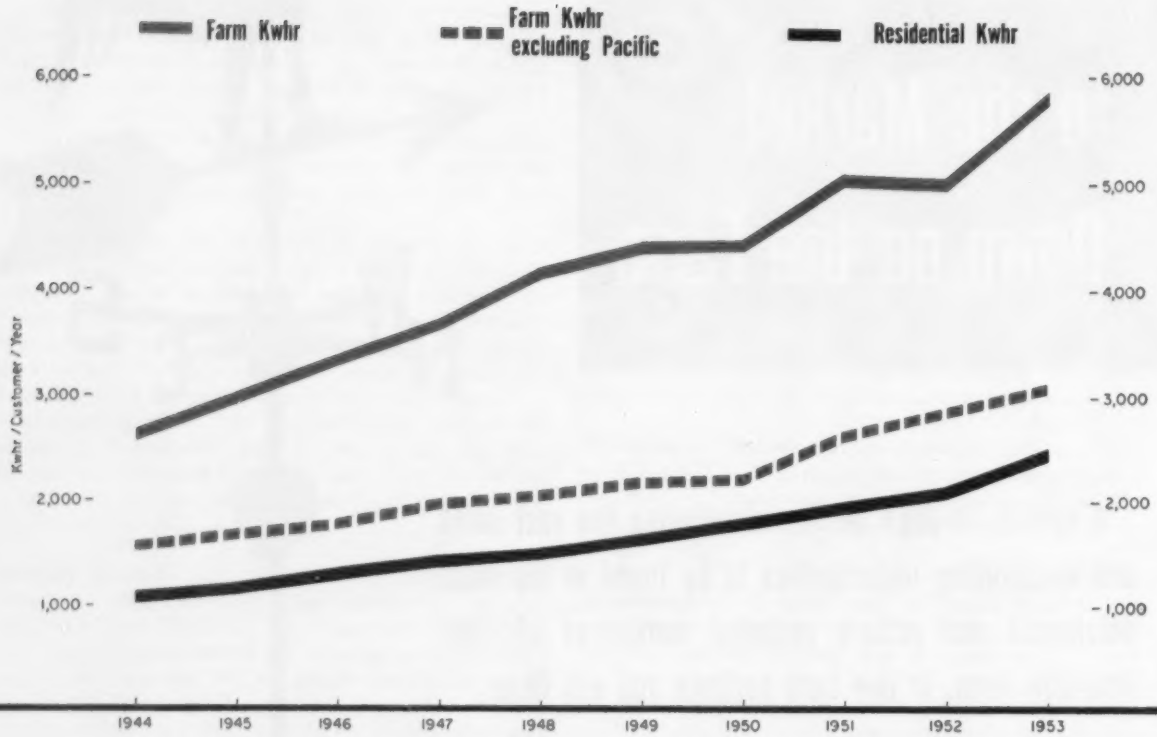
RESEARCH – The work being done in research to give the farmer still more electrical tools, as told by three government specialists . . . pages 134 to 137

FRANK R. INNES
Associate Editor (Retired)

W. J. RIDOUT Jr.
Editor "Electricity on the Farm Magazine"

GROWTH

National Average Electrical Use



United States Farm Statistics

Total farms	5,382,162
Average size of farm (acres)	215.3
Total cash receipts from all products	$31,412,893,000
Dairy products	4,370,425,000
Poultry	3,758,870,000
Vegetables	1,757,053,000
Meat animals	8,852,073,000
Other livestock products	282,031,000
Feed crops	2,227,676,000
Food grains	2,459,900,000
Fruits and tree nuts	1,227,805,000
Tobacco	1,092,196,000
Cotton	3,185,945,000
Oil bearing crops	994,793,000
Other crops	1,204,124,000
(Items are listed in descending order of electricity usage potential)	
Percent of all farms irrigated	5.7

The graph above shows the average farm electric customer in this country using close to 6,000 kwhr per year. This average includes large usage of electricity for irrigation pumping in the Pacific states and does not present a true picture of what we usually mean by the term "farm electrification." A closer approximation is given by the broken line on the graph, from which the Pacific region is excluded. This shows a use of 3,200 kwhr in 1953.

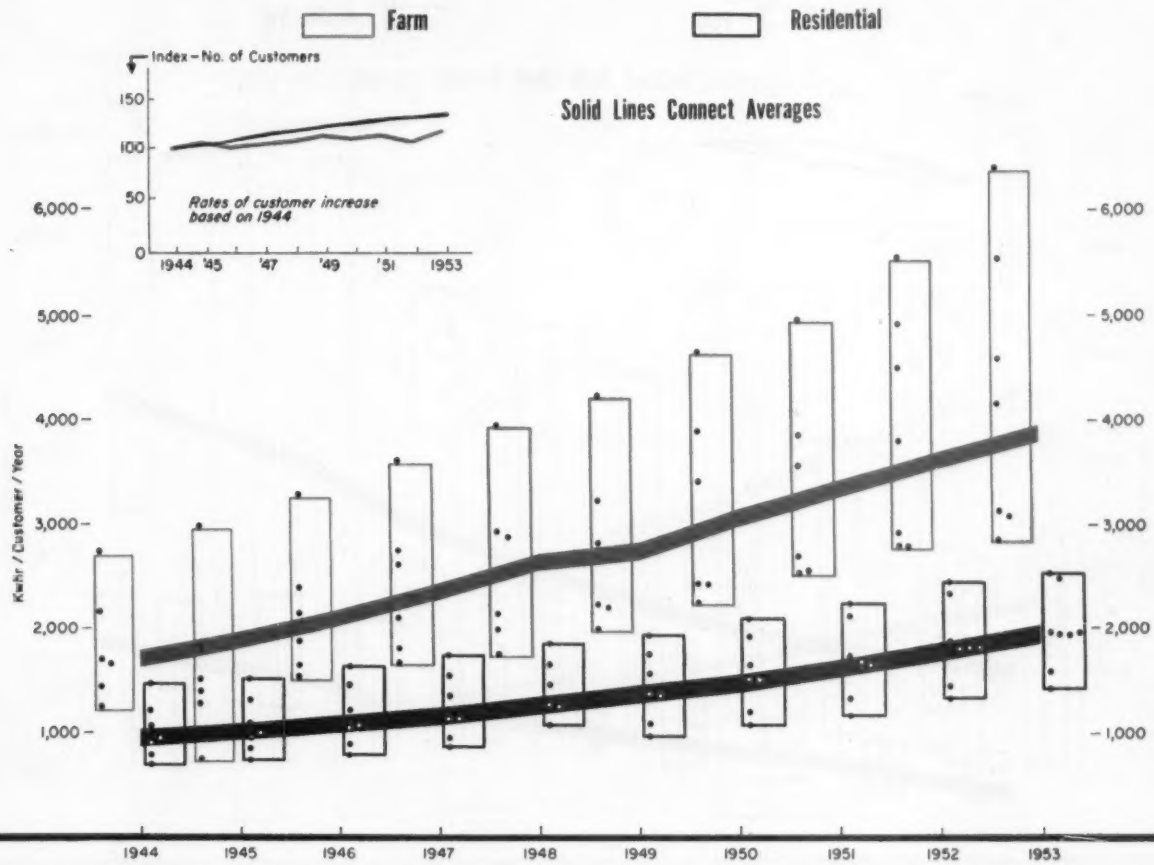
Considering that the average residential usage of electricity was about 2,500 kwhr and that the farm customer is also residential customer, then it appears that the average farm uses only about 700 kwhr per year in production operations. Multiplying this figure by the number of farms gives about 3.75 billion kwhr used in farm production. Set this against the over 190 billion kwhr sold in 1953 for industrial production and one gets an idea of how much farther there is to go in farm electrification.

Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

GROWTH

New England

ELECTRICAL USE AND CONSUMER INCREASE



Reflecting the real impact of industry in this region, as well as in the Middle Atlantic and Pacific, is the fact that in all three regions over a third of the farmers work 100 days or more off the farm. For the New England region the ratio is about 38%. For the nation as a whole about one-fourth of the farmers derive a major source of income off the farm. From the utility point of view, this is good because the automation electricity provides allows a farmer time to seek other regular sources of income. Then he is not dependent entirely on the uncertainties of a seasonal revenue.

Even though New England is considered a dairy area, its largest source of farm income in 1953 was poultry. It accounted for over 35% while dairy ran second with 29%. Without a doubt those suppliers reporting kwhr sales over the average of 3900 serve a high percentage of dairy and poultry farms.

Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

New England Farm Statistics

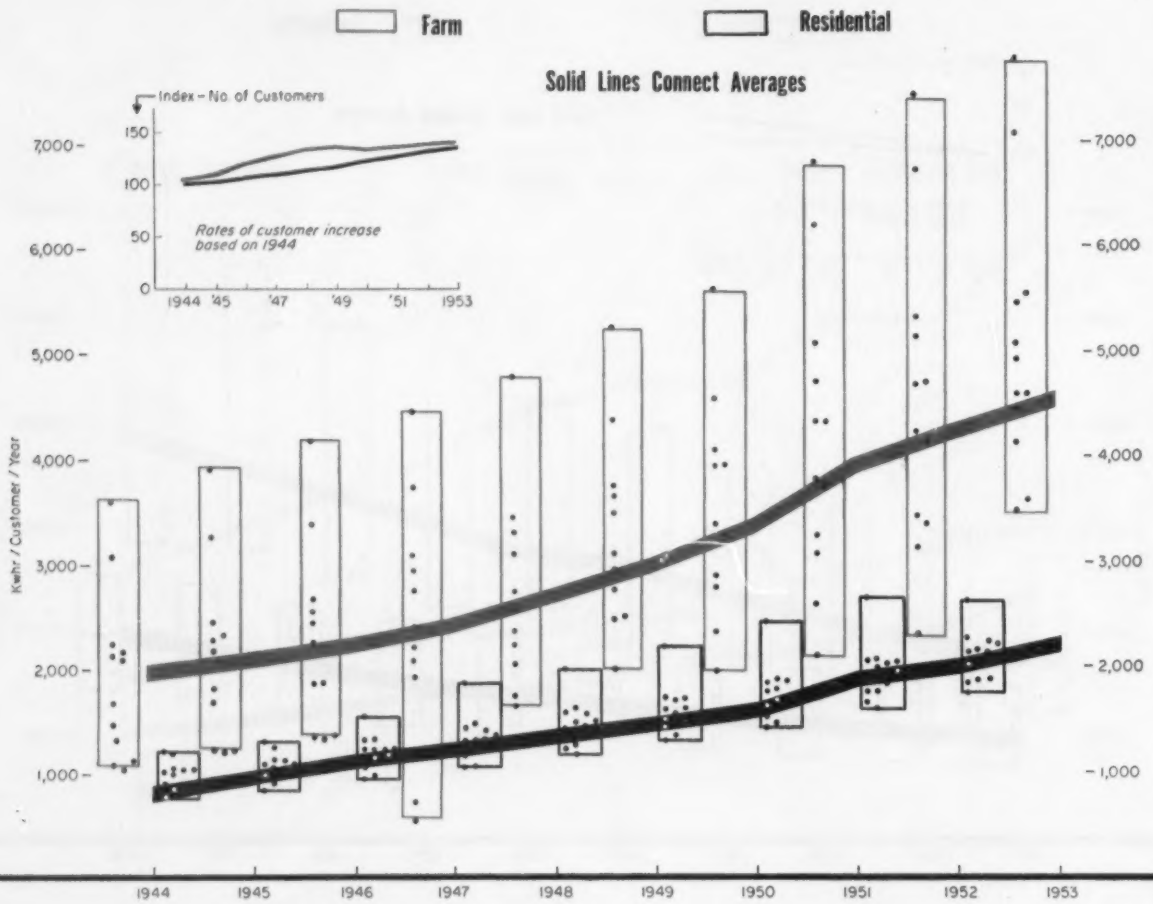
Total farms	**103,225**
Average size of farm (acres)	**121.5**
Total cash receipts from all farm marketings.	**$775,827,000**
Dairy products	**225,693,000**
Poultry	**281,028,000**
Vegetables	**81,655,000**
Meat animals	**38,746,000**
Other livestock products	**10,973,000**
Feed crops	**8,724,000**
Food grains	**11,000**
Fruits and tree nuts	**33,497,000**
Tobacco	**33,837,000**
Cotton	.....
Oil bearing crops	.....
Other crops	**61,663,000**
(Items are listed in descending order of electricity usage potential)	
Percent of all farms irrigated	**1.5**

MAINE • NEW HAMPSHIRE • VERMONT • MASSACHUSETTS • CONNECTICUT • RHODE ISLAND

GROWTH

Middle Atlantic

ELECTRICAL USE AND CONSUMER INCREASE



Middle Atlantic Farm Statistics

Total farms	**296,702**
Average size of farm (acres)	**107.4**
Total cash receipts from all farm marketings.	**$2,040,974,000**
Dairy products	**722,193,000**
Poultry	**544,647,000**
Vegetables	**224,731,000**
Meat animals	**192,834,000**
Other livestock products	**13,593,000**
Feed crops	**48,557,000**
Food grains	**43,623,000**
Fruits and tree nuts	**92,311,000**
Tobacco	**8,563,000**
Cotton	
Oil bearing crops	**1,781,000**
Other crops	**148,141,000**
(Items are listed in descending order of electricity usage potential)	
Percent of all farms irrigated	**0.7**

Farmers in this region are in an enviable position market-wise. About 30% of the total population in the United States reside in the three states. At the same time rapid expansion of urban areas and the high cost of labor due to the pace set by industry put a high price on land and labor. Therefore, efficiency coupled with hard-headed business practices is essential in farming operations. Use of electrical equipment on farms is reflected in the high annual average (4600 kwhrs) for 1953. Almost half of the suppliers who participated in this study reported an annual average of more than 5,000. Two were over 7,000. Yet for this same area 25% of the farms don't have electric water systems. Nearly 200,000 don't heat water electrically.

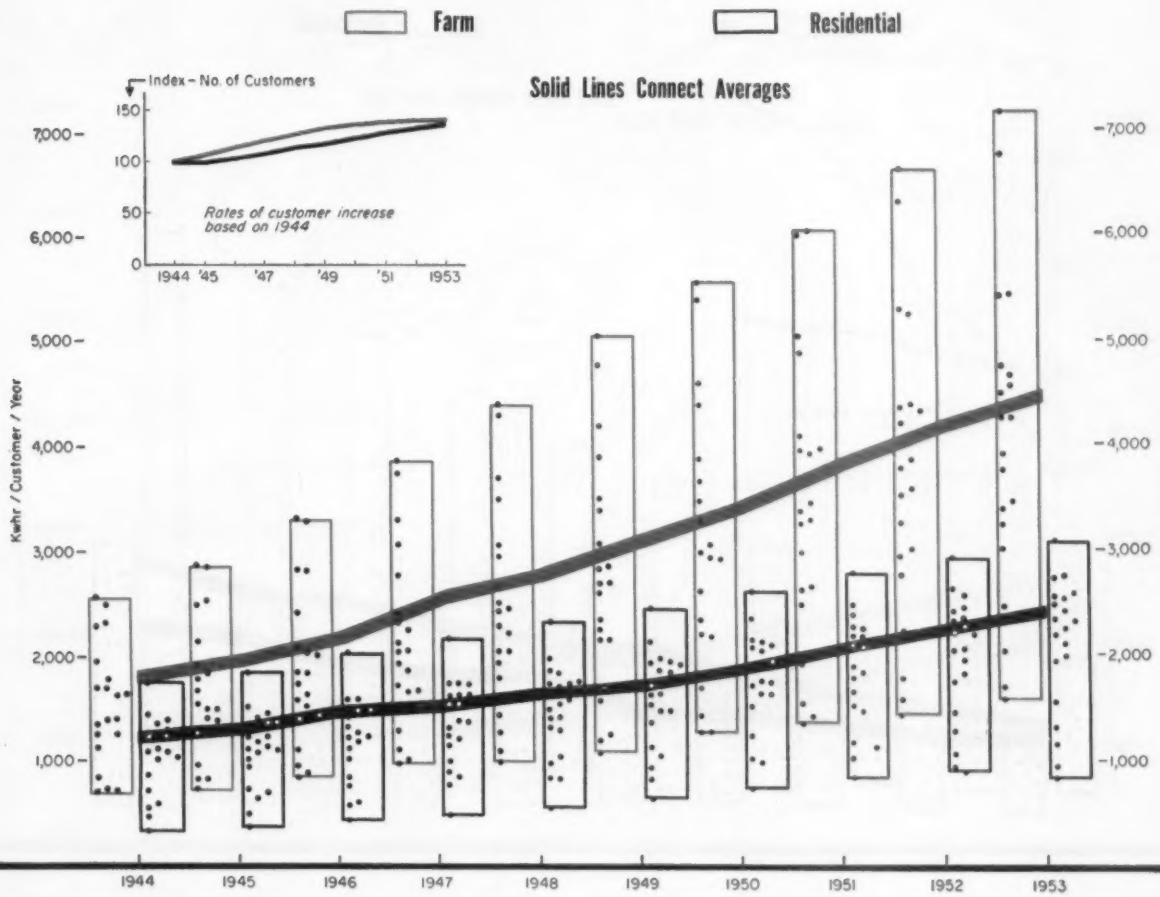
In this region there apparently remains little more to be done in connecting farms. Inset chart shows little recent increase in farm customers.

Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

GROWTH

East North Central

ELECTRICAL USE AND CONSUMER INCREASE



This region produces over 25% of all the dairy products in the United States. There are over 225,000 dairy farms in this area. For a modern dairy farm there is no substitute for electrical equipment. What better way is there to cool milk, unload silos, clean gutters, ventilate, heat water for the milkhouse, mow-dry hay, and properly light the barn? Evidently, from the looks of the chart above, some farmers in too many areas in this region are either doing these jobs some other way or not doing them at all. Why should one supplier average over 7000 kwhr and another less than 2000?

Residential customer use, it is to be noted, does not have this wide variance in average kwhr consumption. Therefore, it can be assumed that residential promotional programs are of about equal effectiveness throughout the region. Farm promotions seem to range from not so hot to very good.

Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

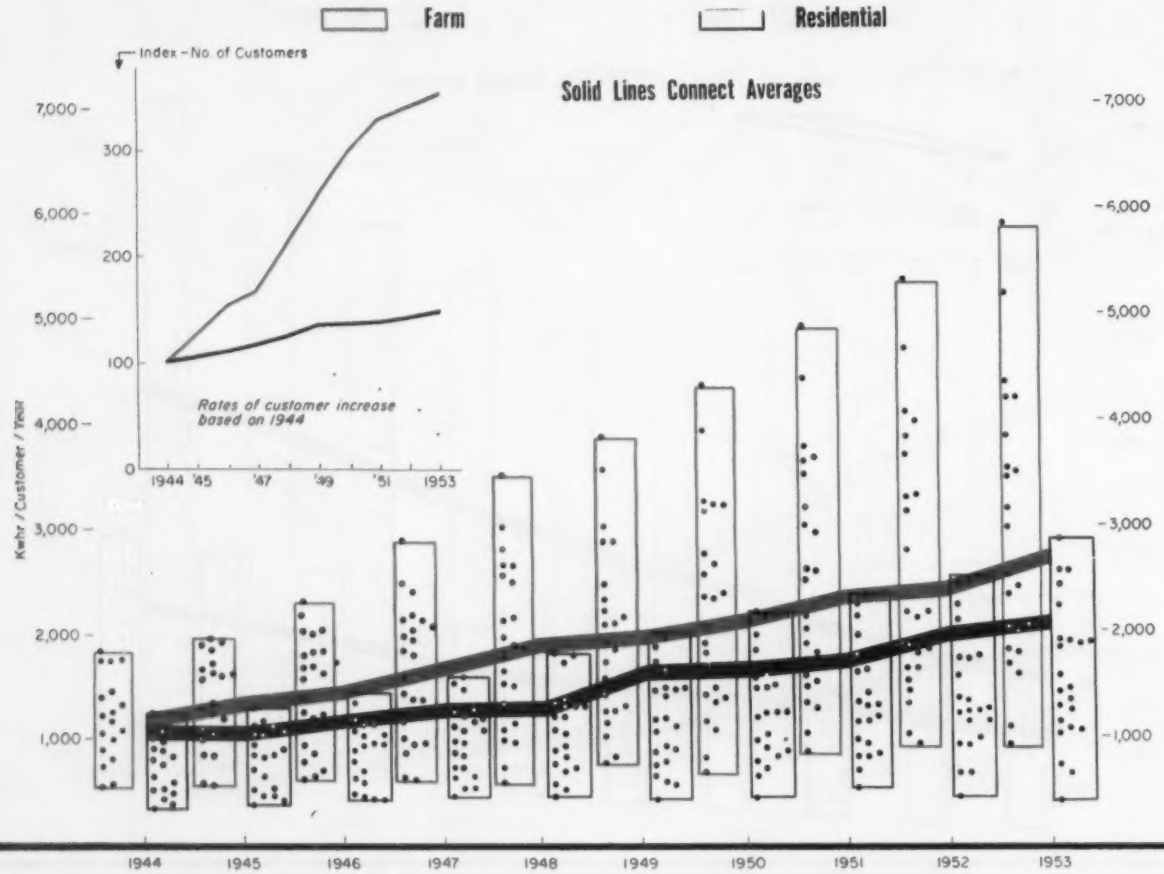
East North Central Farm Statistics

Total farms	885,404
Average size of farm (acres)	126.6
Total cash receipts from all products	$6,032,480,000
Dairy products	1,255,451,000
Poultry	657,628,000
Vegetables	220,262,000
Meat animals	2,118,683,000
Other livestock products	52,932,000
Feed crops	708,721,000
Food grains	349,264,000
Fruits and tree nuts	94,181,000
Tobacco	25,470,000
Cotton	290,000
Oil bearing crops	349,114,000
Other crops	200,484,000
(Items are listed in descending order of electricity usage potential)	
Percent of all farms irrigated	0.2

GROWTH

West North Central

ELECTRICAL USE AND CONSUMER INCREASE



West North Central Farm Statistics

Total farms	982,735
Average size of farm (acres)	289.3
Total cash receipts from all products	$7,824,687,000
Dairy products	735,569,000
Poultry	703,742,000
Vegetables	80,835,000
Meat animals	3,822,056,000
Other livestock products	43,023,000
Feed crops	938,379,000
Food grains	914,316,000
Fruits and tree nuts	8,536,000
Tobacco	2,767,000
Cotton	79,337,000
Oil bearing crops	380,449,000
Other crops	115,678,000
(Items are listed in descending order of electricity usage potential)	
Percent of farms irrigated	1.3

The seven power companies and 16 cooperatives that reported from this region have been connecting new farm customers at a terrific rate, especially since 1947. Based on 1944 the index of increase reached 365% last year. This means that almost four times as many farm customers are on their lines now as there were in 1944. This indicates that about 75% of their present customers have had service for less than 10 years. Most of them have not had enough time to get well started in the application of electricity to their various operations. It can be expected, with the help of aggressive sales activity, that the average kwhr consumption per farm customer for this area will increase very rapidly in the years that lie ahead.

Generally, winters are severe in this region. And since it is mainly a livestock and grain area, heat applications offer a great potential. So does drying, handling and processing for the year-round.

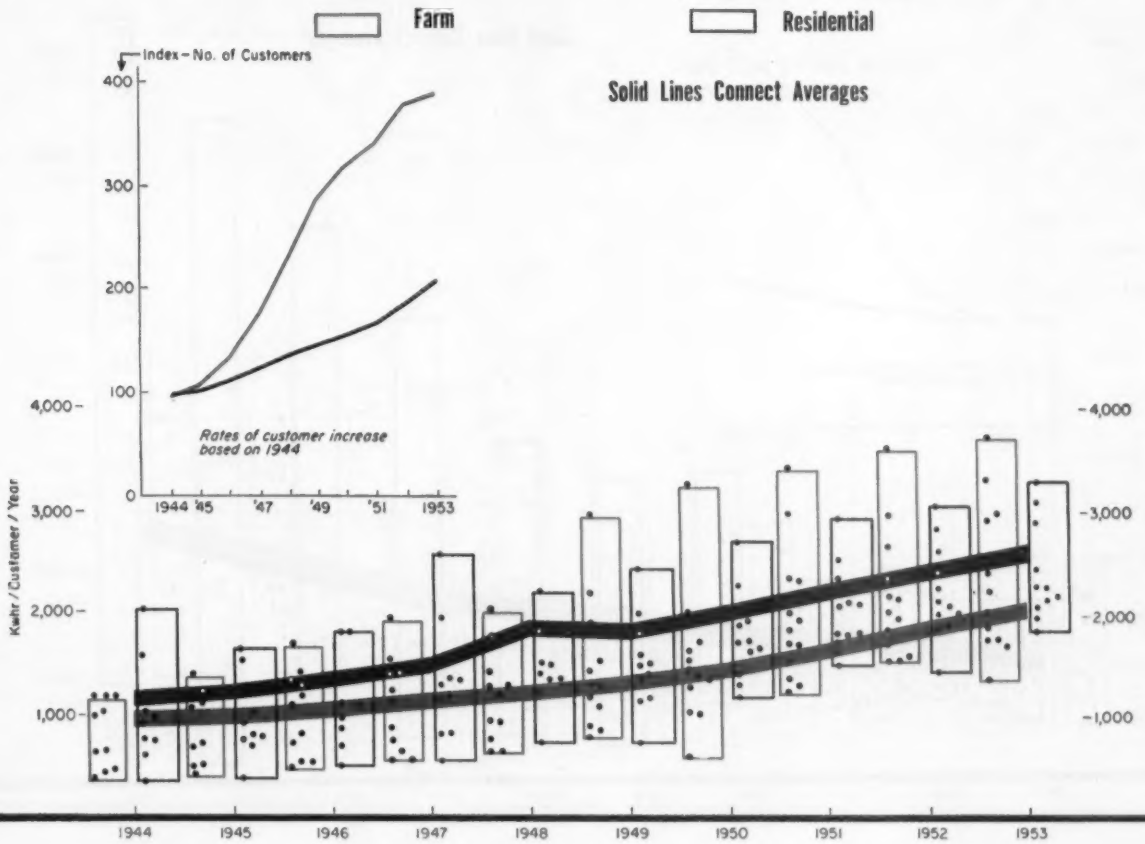
Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

NORTH DAKOTA • SOUTH DAKOTA • MINNESOTA • NEBRASKA • IOWA • KANSAS • MISSOURI

GROWTH

South Atlantic

ELECTRICAL USE AND CONSUMER INCREASE



Cotton isn't "king" any longer in the South Atlantic region. Tobacco is the top crop. But take a closer look at the table. Poultry is way ahead of cotton and is pushing tobacco hard. Dairy products and meat animals are also on the move. Combining poultry, dairy and meat animals, they comprise nearly 40% of the total agricultural income.

Due largely to the rapid increase of farm customers, the farm kwhr average energy use in this region is lagging behind residential and is about the lowest in the nation. Another important reason for this is that row crops like cotton and tobacco do not offer large opportunity for electricity applications. However, it is to be expected that as poultry, dairy and meat animal production increases in response to the population growth indicated by the quite rapid rise in the residential customer index that appears on the inset chart, farm use of electricity will eventually overtake residential.

Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

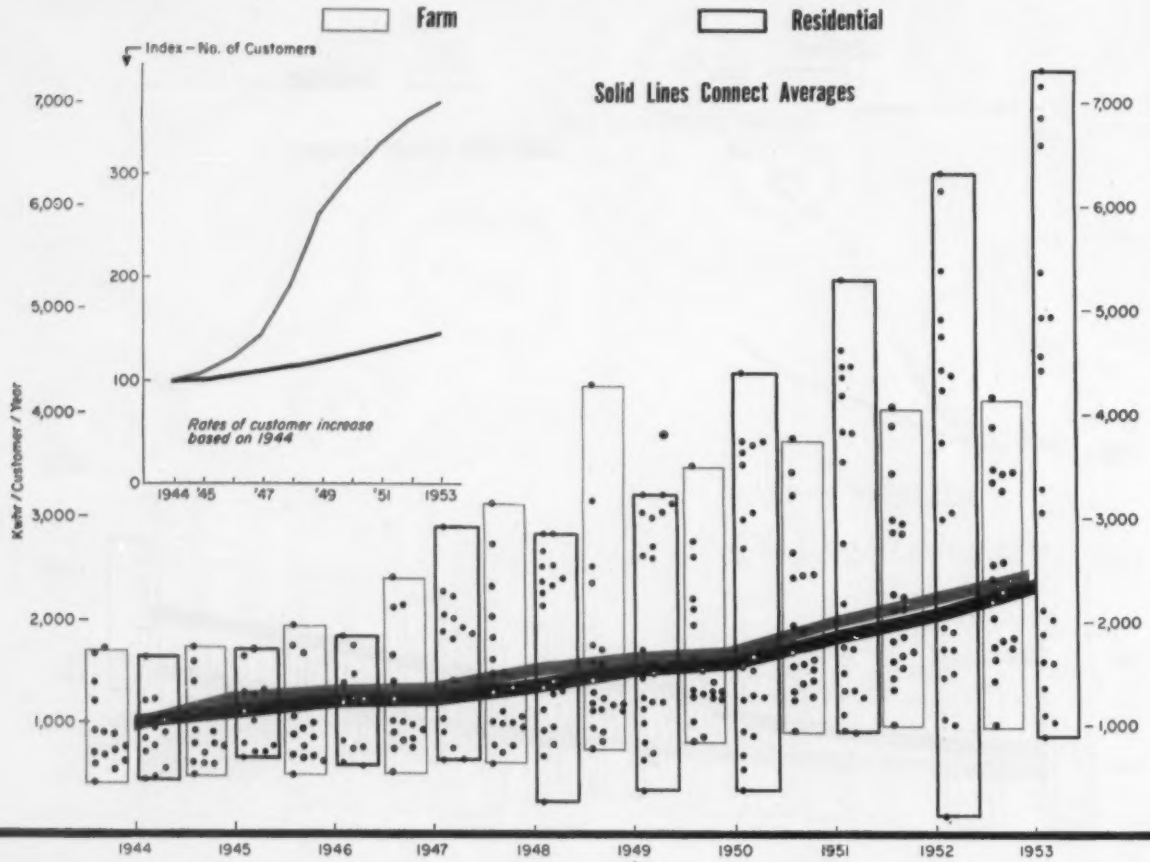
South Atlantic Farm Statistics

Total farms	958,998
Average size of farm (acres)	106.5
Total cash receipts from all products	$3,430,151,000
Dairy products	339,616,000
Poultry	602,593,000
Vegetables	291,064,000
Meat animals	387,040,000
Other livestock products	11,611,000
Feed crops	82,140,000
Food grains	41,292,000
Fruits and tree nuts	249,936,000
Tobacco	727,052,000
Cotton	374,250,000
Oil bearing crops	153,301,000
Other crops	170,256,000
(Items are listed in descending order of electricity usage potential)	
Percent of all farms irrigated	0.7

GROWTH

East South Central

ELECTRICAL USE AND CONSUMER INCREASE



East South Central Farm Statistics

Total farms	**913,002**
Average size of farm (acres)	**87.2**
Total cash receipts from all farm marketings.	**$2,107,459,000**
Dairy products	**220,541,000**
Poultry	**194,913,000**
Vegetables	**37,288,000**
Meat animals	**388,369,000**
Other livestock products	**7,734,000**
Feed crops	**44,798,000**
Food grains	**27,170,000**
Fruits and tree nuts	**15,822,000**
Tobacco	**294,507,000**
Cotton	**867,731,000**
Oil bearing crops	**48,102,000**
Other crops	**70,484,000**
(Items are listed in descending order of electricity usage potential)	
Percent of farms irrigated	**0.05**

Cotton is certainly "king" in this region. It accounted for 40% of the total cash receipts from all farm marketings. But dairy products, poultry, and meat animals combined equaled cotton in providing cash income to farmers of the region. It is on increases in these productions that greater farm use of electricity must depend most largely. In this connection, the very small proportion of farms irrigated is to be noted. Much larger use of pumped water will be required for major increase in dairy, poultry and meat animal productions. Here, probably, is the largest opportunity for electricity.

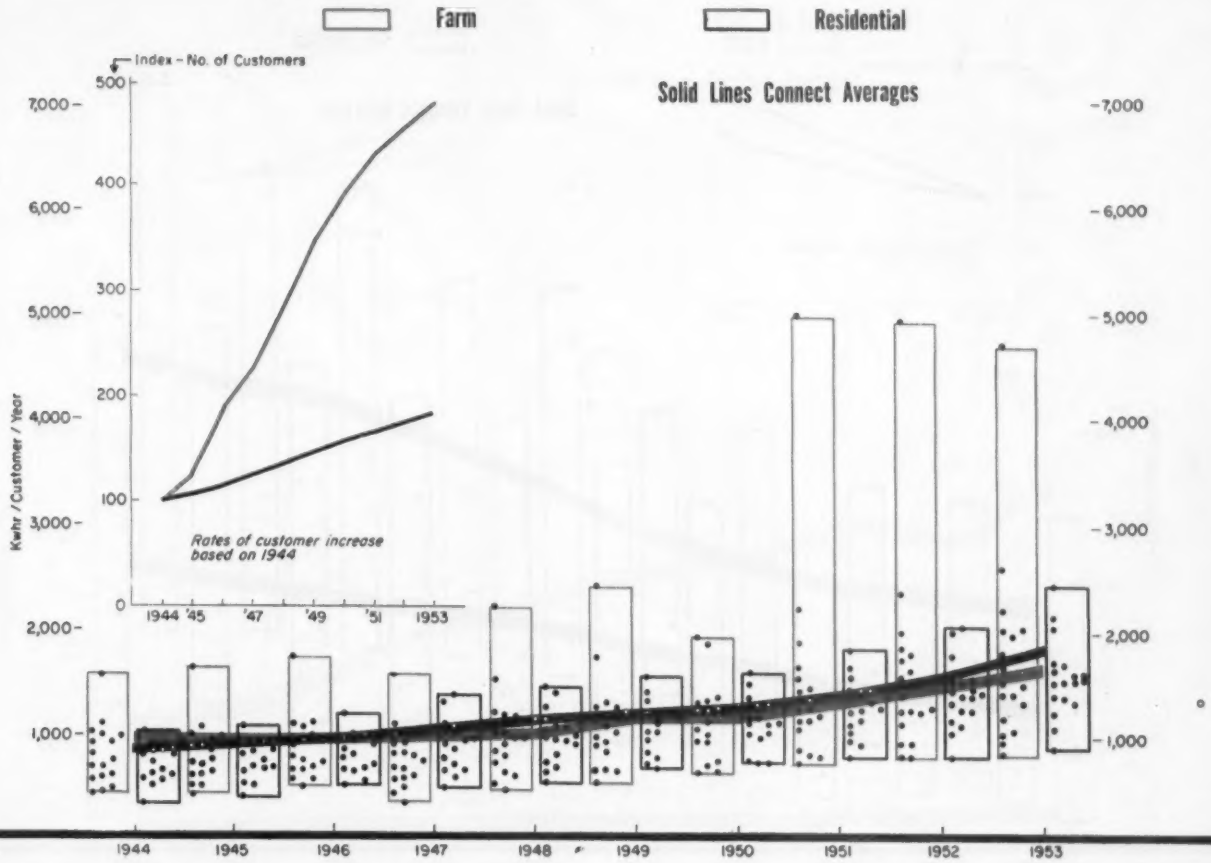
The very high averages of residential kwhr in recent years reported by some of the respondents show the large use of electricity for house heating in the TVA area. This factor rather vitiates any comparison between farm and residential usage and explains why the average for the latter is higher for the whole region.

Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

GROWTH

West South Central

ELECTRICAL USE AND CONSUMER INCREASE


Farm
Residential
Index - No. of Customers
Solid Lines Connect Averages
Kwhr / Customer / Year
Rates of customer increase based on 1944
1944 '45 '47 '49 '51 1953
1944 1945 1946 1947 1948 1949 1950 1951 1952 1953

Largest contributor to farm income in this region is cotton, followed by meat animals, food grains and poultry in that order. This line up of agricultural production is much of the reason why average farm use of electricity is so low. Another important factor appears on the inset chart—the rapid rise in the index of farm customer growth in recent years diluting the average of the region considerably.

The three very high averages of 1951-'52-'53 were reported by one electricity supplier who furnished no data for previous years. They look rather lonesome so far above the rest, but indicate apparently what can be done by effective promotion.

The index of residential customer increase is evidence of the population growth of the region, caused mostly by expansion of the petroleum industry. This growth will continue, providing wider local market for agricultural production, and corresponding wider opportunity for farm electric applications.

Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

West South Central Farm Statistics

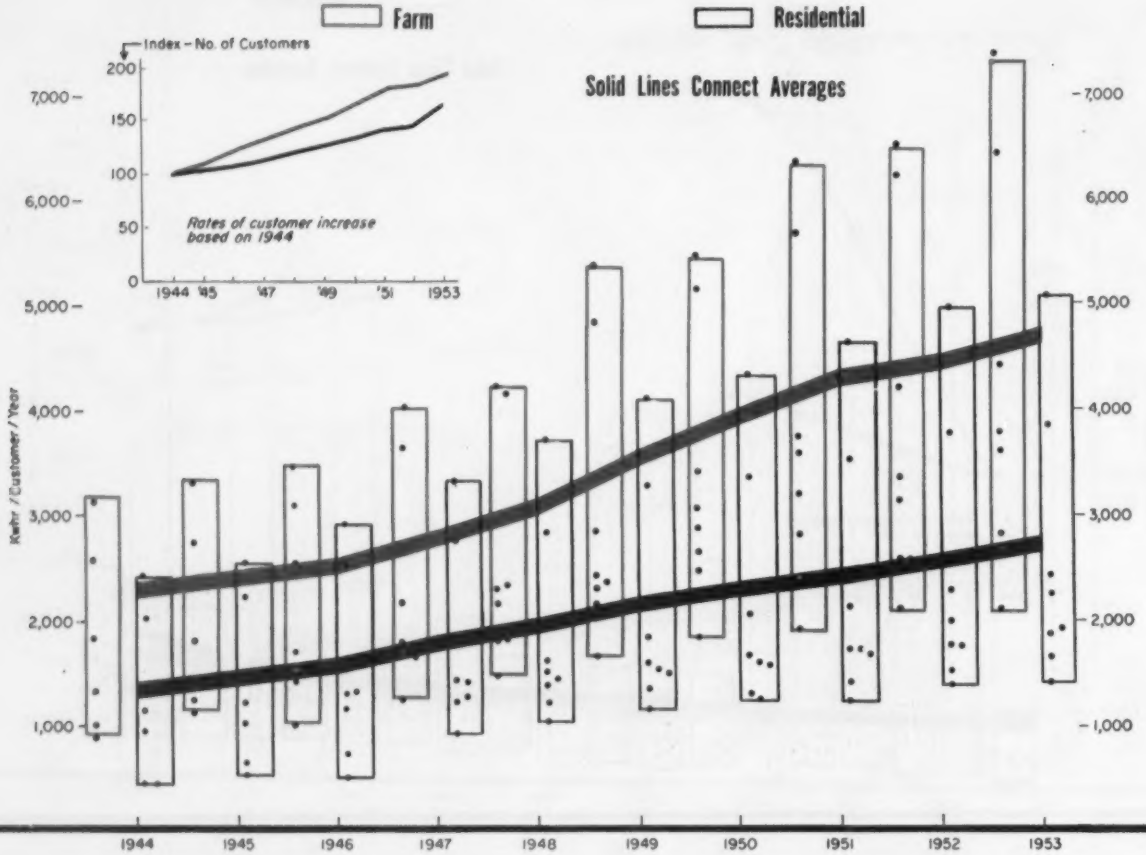
Total farms	**780,423**
Average size of farm (acres)	**271.0**
Total cash receipts from all farm marketings.	**$3,475,075,000**
Dairy products	**268,243,000**
Poultry	**305,391,000**
Vegetables	**114,011,000**
Meat animals	**755,603,000**
Other livestock products	**46,535,000**
Feed crops	**114,055,000**
Food grains	**400,261,000**
Fruits and tree nuts	**34,500,000**
Tobacco	.....
Cotton	**1,167,054,000**
Oil bearing crops	**57,480,000**
Other crops	**101,942,000**
(Items are listed in descending order of electricity usage potential)	
Percent of farms irrigated	**4.2**

ARKANSAS • LOUISIANA • OKLAHOMA • TEXAS

GROWTH

Mountain

ELECTRICAL USE AND CONSUMER INCREASE



Mountain Farm Statistics

Total farms	194,858
Average size of farm (acres)	1,284.1
Total cash receipts from all products	$2,132,952,000
Dairy products	154,652,000
Poultry	88,830,000
Vegetables	200,779,000
Meat animals	707,929,000
Other livestock products	54,754,000
Feed crops	102,568,000
Food grains	374,981,000
Fruits and tree nuts	24,413,000
Tobacco	.....
Cotton	316,305,000
Oil bearing crops	1,671,000
Other crops	107,070,000
(Items are listed in descending order of electricity usage potential)	
Percent of farms irrigated	62.8

In all of this region which includes eight states there are less than 200,000 farms. There are more farms in Ohio than there are in this entire region. Average acreage per farm is nearly 1,300.

Dairy and poultry are incidental to cattle, grain, and cotton. Even so, the average kwhr consumption is high. This, of course, is due largely to irrigation. In 1950 over 60% of the farms were irrigated. It's probably close to 70% now. On the other hand, larger farms must by necessity be self sufficient. Processing, freezing and storage, elevating, conveying, shop equipment for fast repairs to farm machinery, and all those applications that add to the comfort of living are very necessary.

The rapid growth of this region is illustrated by the rate of customer increase. Residential as well as farm have increased at a rate of over 15%. Sharp increases in population will by necessity increase the need for more dairy and poultry production.

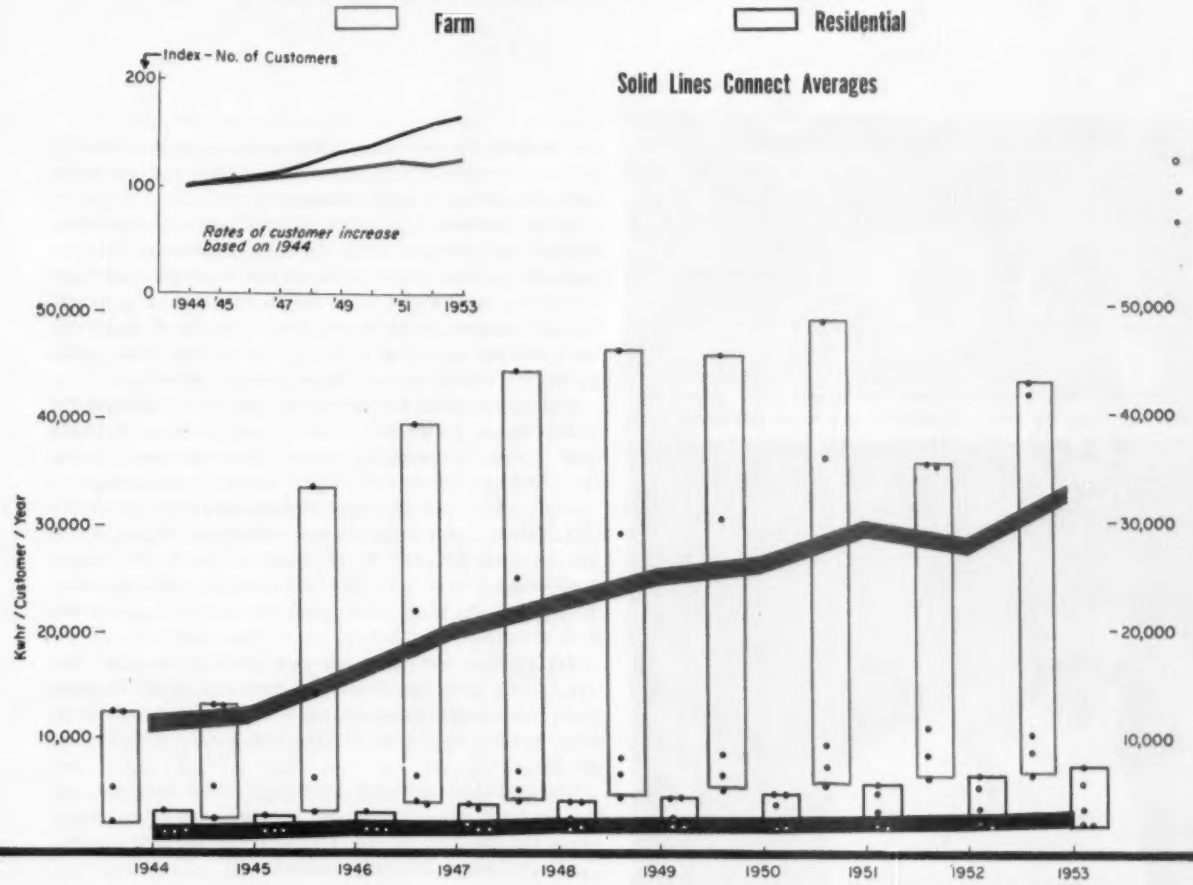
Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

MONTANA • IDAHO • WYOMING • NEVADA • UTAH • COLORADO • ARIZONA • NEW MEXICO

GROWTH

Pacific

ELECTRICAL USE AND CONSUMER INCREASE



The estimated average annual kwhr consumption per farm including all 266,815 farms for the region is 21,774 for 1953. For those suppliers who participated in this study, the average exceeded 30,000. About half of the farmers in this region irrigate their land. For the Mountain as well as the Pacific region, irrigation is a pre-requisite for any agricultural operation except for dry-farming grain production and cattle grazing. The very slow rise of the index of farm customer increase indicates that electricity has been available to the farms and ranches of the region for a long time.

It's hard to comprehend when comparing this region with the rest of the country that the average gross income—average, mind you—for all of the farms in Washington, Oregon, and California was over $13,000 in 1953. The average for every farm in the United States was less than $6,000. California is now the nation's top agricultural state.

Sources: U. S. Department of Agriculture; U. S. Census Bureau, Department of Commerce.

Pacific Farm Statistics

Total farms	**266,815**
Average size of farm (acres)	**278.5**
Total cash receipts from all products	**$3,593,286,000**
Dairy products	**449,467,000**
Poultry	**380,098,000**
Vegetables	**506,428,000**
Meat animals	**440,813,000**
Other livestock products	**40,876,000**
Feed crops	**179,734,000**
Food grains	**308,982,000**
Fruits and tree nuts	**674,609,000**
Tobacco	
Cotton	**380,978,000**
Oil bearing crops	**2,895,000**
Other crops	**228,406,000**
(Items are listed in descending order of electricity usage potential)	
Percentage of all farms irrigated	**47.0**

APPLICATIONS

Trout and Turkeys Raised in Desert, Electrically

JACK SALTER, California Electric Power Co, Riverside, Calif.

Who ever heard of raising fish in the desert? Or even turkeys for that matter. Stoddard Jess of Victorville, Calif. does both, smack in the middle of the Mohave Desert. And he does it with one of the slickest systems to be found anywhere.

Electrical use isn't confined to just irrigation pumping. It does 90% of the other jobs around his farm, too. His turkey "department" calls on it to supply inside and outside lighting to operate incubators, brooders and watering system. In the fish "department" it runs pumps, lights, meat grinders and water heaters.

RAINBOW TROUT, grown in desert rearing ponds, are packaged at the Jess farm and sold to restaurants and hotels throughout U. S.

In the feed mill it powers grinders, blowers, mixers, automatic scales, hammer mill, conveyors, molasses and concentrate pumps. Equipment in the machine shops are completely electric-operated. So are the appliances including dishwashers, freezers and ranges, in the homes Stoddard provides for some of his 35 regular employees. Altogether, his ranch has a connected load of 491.8 kw.

Stoddard started his ranch in 1932 after quitting the University of California. Friends and relatives could see only failure for a man who would go to the desert during the bottom of the depression and set up in agriculture.

Stoddard's ranch of today encompasses 900 acres with 600 of them under irrigation and cultivation. Some 50,000 turkeys and 250,000 lb of rainbow trout are raised, processed, frozen and packed annually for shipment throughout the U. S. His trout, fed carefully controlled diets, frequently weigh in at more than 10 lb.

But turkeys and trout are not the only bounties this desert land gives up. Fields of corn and alfalfa flourish under electrically pumped irrigation water. Most of it, after treating in the feed mill, ends up in turkey food troughs.

Stoddard Jess calls his ranch operation "a zany one that just got out of hand and kept growing," but everywhere the hand of careful planning and far-sighted electrical application is clearly evident.

Annual Ranch Production

50,000 Turkeys
250,000 lb Rainbow Trout

Electricity Usage

Annual Consumption—1,553,640 kwhr
Connected Load—491.8 kw
435.2 kw (prod. equipment only)

Electrical Farming Tips

With automatic poultry feeders, Pennsylvania State College produced a lb of broiler on .44 less lb of feed. Hens required ½ lb less feed to produce one doz eggs when on an automatic feeder . . . How much is water worth? It's worth about $100 per acre on pasture, according to University of Tennessee Dairy Experiment Station.

APPLICATIONS

Electricity Maintains Employment on Onion Farm

R. E. JOHNSON, Toledo Edison Co, Toledo, Ohio

With thoughtful application of electric power in processing and packaging, a great deal can be done to flatten out the peaks and valleys of seasonal farm employment and provide a steady flow of products from farm to consumer.

For example, the John F. Stambaugh farm, located in the north-central part of Ohio, has worked out an arrangement whereby its ever-expanding onion and potato production can be marketed steadily throughout the year.

This results in stable employment for the twenty "heads-of-family" who live on the farm in houses provided by the management. There are 50 people on the payroll in summer and 20 during the winter. Most of these people would have no jobs during the winter months if the products were all sold in bulk at one time, which is the procedure at most farms.

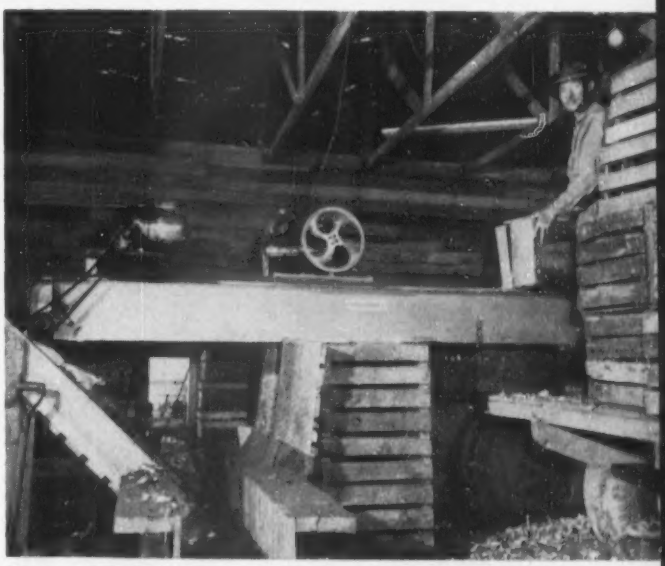
This 1160-acre farm of rich muck land is well suited for growing celery, radishes, carrots, onions, and potatoes. Yields of 900 bu of onions or 600 bu of potatoes per acre are common. With 150 acres regularly used to grow onions and 110 acres in potatoes, a large storage and packaging plant is necessary.

There are two bulk storages of 40,000 bu capacity on each side of the processing room. Ventilation in the storages is provided by two 7½-hp propeller fans in each storage room. Approximately 10 cfm per sq ft of floor area is available for the onions or potatoes which are stored in bulk on a slatted floor. Floor is made in sections which can be removed and stacked when not in use.

From the time the product goes into the storage building, until trucks carry it away to Cleveland and other markets, it is handled and packaged by electrically operated conveyors and other machinery. In all, there are an even 100 electric motors in use on the farm.

The plant receives three-phase power from the North Central Electric Cooperative, Inc, of Attica, Ohio. Cost is reported to be $120 per month.

Convenience, dependability and versatility of electric power has enabled Stambaugh to build up a stable business with year-round employment for its regular employees. The customer receives a quality product and the economy of the area is benefited.



HANDY UNLOADING arrangement puts onions from field directly onto conveyor belt which carries them into the farm's packaging room

IN PACKAGING PLANT Stambaugh employees process onions and other vegetables for shipment. Electric equipment is used throughout

Annual Farm Production

120,000 bu Onions
60,000 bu Potatoes

Electricity Usage

Annual Consumption—48,000 kwhr
Connected Load—127 kw

APPLICATIONS

Three Barns Tell Story of Electrical Progress

T. K. DIMMITT, Puget Sound Power & Light Co, Seattle, Wash.

"If you can't do it with electricity you are working too hard," makes a lot of sense when Ralph Keller, nationally known breeder of purebred Jersey cattle says it. Keller has been testing ideas for a lifetime. On his dairy farm, a landmark on Puget Sound at Redmond, Wash. near Seattle, he has been able to realize a boyhood dream: to breed a herd of a hundred purebred Jerseys that would set world records.*

Intelligent farm management is apparent everywhere on this 235-acre farm. You see it in the fully electrified modern rambling brick home with picture windows; you are aware of it in the fields where the Kellers have their own sprinkler irrigation system to grow grasses and legumes; it is in evidence in the marvelous herd of milk producers; and especially is this desire to accept modern ideas shown in the three dairy barns—each a distinct type and a symbol of three generations of progress. The farm is unique for its three barns.

Barns Mark Progress . . . One barn is a shaggy landmark, it was originally built by Keller's father, 80 years ago and has not been torn down purely for sentimental reasons.

The second barn stands smart, white, plumb and trim. It is a conventional dairy barn which, to many a dairy farmer, would appear ideally arranged.

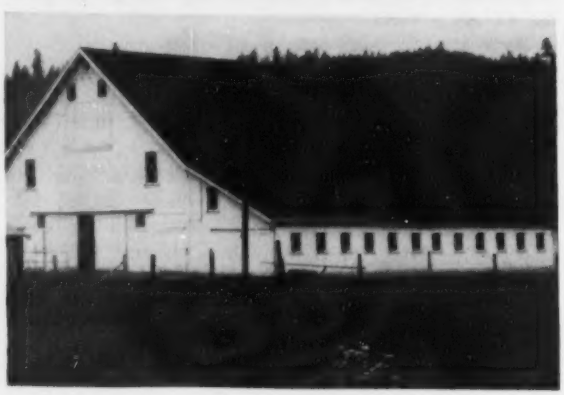
The third barn is a modern milking unit where the cows are brought to a waiting shed and milked in gangs. Milk is handled by stainless steel pipes and bulk tanks. It has an assembly line arrangement and teaches many cogent lessons in dairy management.

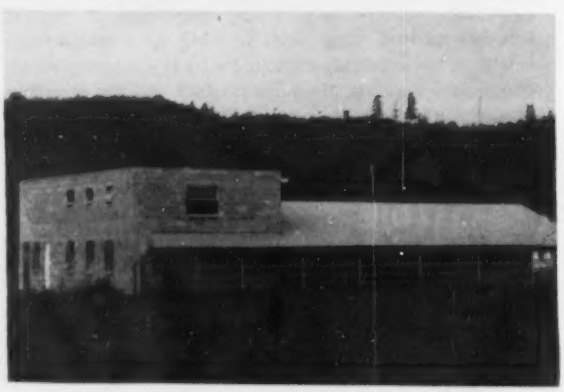
Electricity Put to Many Uses . . . All conditions of milking and milk handling are kept as sanitary as possible. Electric milkers, holding tank, refrigeration, ventilation, hot and cold running water and lighting are all parts of this installation. Commenting upon these labor saving methods, Keller said: "What a farmer needs to do more than anything else is to cut down on his work and not to add to it. By substituting electricity for hand labor he is doing just that."

When asked about the cost of using sprinkler irrigation for his pastures, Keller answers by inviting you to make comparisons with his pastures and neighboring pastures without supplemental water. He says, "an irrigation system will pay for itself in one to three years." Using water and fertilizer judiciously this dairy farm has a plentiful supply of grasses and legumes. And through the control of his feed in this way, together with modern farm practices, Keller believes his success in dairy farming is assured.

Electricity Usage

Annual Consumption—20,000 kwhr
Connected Load—50 kw (both home and dairy)





THREE KELLER BARNS: Cedar barn built 80 years ago (top), Conventional type (center), and new electrically equipped barn (bottom)

* Keller's herd has won a mantleful of national and state awards over the years. In 1944 and 1952 the President's Trophy, awarded annually to the highest producing Jersey cow in the nation, was won by Keller cows.

APPLICATIONS

Electric Beds Turn Out Million Plus Potato Plants

L. H. GILLESPIE, Georgia Power Co, Macon, Ga.

One of the largest electric hotbed installations in the Southeast, is operated at Claxton, Ga. by the J. L. Budreau Co where 1,200,000 sweet potato plants were pulled last spring from 12 beds.

The company reported that 30 bu of treated Puerto Rico seed potatoes were planted in each bed during the first week of last March. The first plants were pulled the first week in April. Each bed produced 100,000 hardy plants of uniform growth.

Two cold frames, or unheated beds, were seeded at the same time as the heated ones. They required three weeks longer to produce plants of transplanting size, and those produced were of uneven growth.

Farm Production

1,200,000 Sweet Potato Plants

Electricity Usage

Annual Consumption—22,160 kwhr (Feb. 9 to May 27)
Connected Load—38.4 kw

TIME REQUIRED to produce sweet potato plants of transplanting size was nearly halved by use of these twelve (6x60 ft.) electric hotbeds

Good Wiring Ups Electrical Use, Farm Production

LOUIS FULLER, Public Service Electric & Gas Co, Burlington, N. J.

An up-to-date wiring system coupled with modern electrical applications is helping Lester Jones' family type farm in New Jersey's Burlington County to roll up some impressive production figures (See table).

Three phase power is carried into the Jones farm from a pole-mounted transformer bank strategically located close to the farm's load center.

In his 12 years as owner, Jones has had untold difficulties with overloaded circuits, blown fuses, burned-up motors, etc. And small wonder. When he took over, a monthly average of 500 kwhr was being supplied through a poorly located two-wire service. Now, thanks to planned wiring, equipment operates trouble free, and average monthly electric use has reached 2600 kwhr.

Jones' list of electrical helpers is a long one. He has just ordered a stainless steel 5-hp tank-type milk cooler, and a pump-operated pipeline system from milking machines directly to the tank cooler is planned. This method will eliminate both the handling of milk cans and exposure of milk to the air.

Jones recently added a 7½-hp crop dryer for removing moisture from seed corn. He plans to extend its use by installing an air duct distribution system in the barn loft so he can finish his hay in the barn rather than in the field. This way he figures he will reduce damage from dew, rain and sunlight and save manhours heretofore wasted on hay that later spoiled.

Other important electrical workers include milkers, barn cleaners, wagon and silo unloaders, a bale elevator and conveyor, water heaters, ventilator fans and brooders.

Annual Farm Production

750,000 lbs Milk
1,000 tons Tomatoes
1,200 bu Hybrid Seed Corn
3,500 bu Commercial Corn

Electricity Usage

Annual Consumption—31,200 kwhr
(production equipment including heat)
Connected Load—34 kw

APPLICATIONS

Ingenuity and Electricity Ups Poultryman's Production

TROY INGRAM, Alabama Power Co, Oneonta, Ala.

If you don't believe looking after 6,000 laying hens with 1,500 replacements coming on at all times is a full-time job for electricity take a look at the farm of Verbon Robbins, Blount County, Ala. poultryman.

Some time ago, Robbins built a poultry house 400 x 40 ft to accommodate 4,000 hens. He has just completed a second addition 200 x 40 ft to accommodate another 2,000. Houses are equipped with an electric watering system, an automatic poultry feeder, and other labor-saving devices enabling him and his father-in-law to handle the entire operation.

Says Robbins "if it weren't for my electric service, I just wouldn't be able to operate."

Did It Himself . . . Most of his equipment is "home made." A 1-hp electric motor, mounted on an insecticide sprayer, enables him to spray his two buildings in about two hours. Before the operation was electrified, it took him three days. Another ½-hp motor, installed on a manure unloader, likewise saves countless hours.

Last winter, Robbins' hens went into a production slump. He noticed that the birds weren't drinking the water they should. With the assistance of the local Alabama Power Co rural service engineer, he installed heating cable in the watering troughs and around the spigots to raise water temperature to 55-60F. Additional night lights also were installed. The hens resumed their normal drinking habits and within a week egg production was up to its old standards once again.

In another production slump last summer, Robbins lost about 250 laying hens due to excessive heat. In short order he installed thirteen 24-in fans throughout the laying houses to provide supplemental ventilation. Immediately, losses were eliminated and egg production increased.

Night Lighting . . . Robbins grows his replacements on a range. He was troubled at first with losses from hawks, owls, and foxes, but brought that to a stop with night lighting. He rigged up three 300-w spotlights on top of an old barn. By attaching them to a shaft operated by an old washing machine motor he keeps them constantly moving. To get still more light penetration, he bought an old beacon light which employs a 3,000-w lamp and a 1,500-w blinker.

An automatic egg grader recently installed in his egg room has helped a great deal. The egg room built in the side of a hill below the laying houses is maintained at a temperature of about 70F. This has greatly improved his hatchability record particularly since he built his own "pre-cooling" box which brings temperatures to 55F.

Annual Farm Production

1,250,000 Eggs

Electricity Usage

Estimated Annual Consumption—45,000 kwhr
Connected Load—37 kw

HEATING CABLE on Robbins' poultry watering troughs, by raising water temperatures to 55-60F, has helped to halt an egg production slump

APPLICATIONS

Electrified Rural Industry Helps Keep Money Home

H. G. WALT, Consumers Power Co, Lansing, Mich

Up in Eaton County, Mich. John Forell and his sons run a packing operation that would gladden the heart of any booster for hometown enterprise.

Forell grows his own produce, buys more from other local farms, and then with local labor processes and cans it in a packing plant on his own premises. The result: a ready market for local crops, an added summertime payroll for the Eaton County economy and a thriving business for Forell. Tomatoes and string beans bearing Forell's own label find their way to dinner tables throughout Michigan and Illinois and as far away as Florida.

Underneath this success story lies some well-planned applications of electric energy. They begin the moment the ripe vegetables leave the field. And throughout the process—in washing, handling, and packaging—electric equipment spurs production. Such speed is essential if the vegetables are to be canned and made ready for market at the peak of their goodness.

Consider tomatoes: arriving at the plant they are first dumped into a washer for a two-min scrubbing. Next comes a rinsing via a 1-hp conveyor which lifts them past high-pressure streams of water. From there they go to a 1-hp scalder where, as their skins are loosened, they drop onto an 18-in, 3-hp conveyor belt. Workers (some 30 local farm women) pick the tomatoes off the belt and peel them into 12-qt pails. Then they're dumped into a 1-hp can filler (supplied with cans via a conveyor belt from the room above). Salt is added, final inspection is made, and a 3-hp closing machine seals the cans. Cooking follows (cans and all) in open top cookers, and finally they're packed into 24-can cartons. Electricity is even used here: a ½-hp stitcher assembles the cartons and another ½-hp machine affixes the labels. Waste material from the tomatoes is either fed to cattle or returned to the field as fertilizer.

String bean canning follows much the same pattern as tomatoes but with two added operations. First the beans must be snipped. Five snippers driven from a line shaft powered with a 5 hp motor do the job. Then two ½-hp conveyors carry them to a ¾-hp cutter where they are reduced to 1-in lengths. Second, they must be blanched to stop enzyme action. A 3-hp cylinder steam blancher takes care of that. The actual canning is similar to that of the tomatoes except that the cooking is done under pressure.

Annual Farm Production

240,000 cans Tomatoes
144,000 cans String Beans

Electricity Usage

Annual Consumption—4,000 kwhr
Connected Load—11.8 kw

ELECTRIC CONVEYOR BELTS aid in assorting and canning tomatoes and string beans at Forell Farm. Operation gives work to local people

Electric energy for this operation is purchased from Consumers Power Co. The electricity consumed by the Forell enterprise operates all of the lights and mechanized equipment for the cannery.

All in all, Forell's plant, operating seasonally, uses about 4,000 kwhr per year. That's not much electricity in a year, but it proves how a little electricity when wisely used can help build a hometown industry for hometown people.

Electrical Farming Tip

Results of two-year tests carried on cooperatively by the U. S. Department of Agriculture and the Tennessee Experiment Station show that pasture irrigation is profitable. The test area was nine acres seeded to a mixture of orchard grass, Ladino clover, and alfalfa. Part of the area was irrigated when rainfall was short and the rest was not. The irrigated portion resulted in an average increase of 49% in the number of standard cow-days of grazing, a 54% increase in milk production per acre, and a 38% increase in income above costs.

APPLICATIONS

Poultry Cage Maker Builds Business with Electricity

WALLACE WEAVER, Alabama Power Co, Montevallo, Ala.

WIRE LAYING CAGES are shown by Bill Lawler to the author. Lawler buys wire by the carload, ships cages throughout U. S., Latin America

Give the farmer something he needs and there's no telling how much your business can grow.

Bill Lawler of Shelby County, Ala. found this out fast. Bill makes wire laying cages for poultry. And since going into business four years ago, he already has had to construct two new buildings to keep up with the demand.

While there are two other cage producers in Alabama, Bill is the only one who does the entire job electrically. His electric equipment includes saws, welders, drill presses, milling machines, planers, wire straighteners, and cutters.

Production

2,000 Cages Per Day (does not operate at full capacity full time).

Electricity Usage

Annual Consumption—14,500 kwhr
Connected Load—59 kw

Electricity Helps Produce Better Hybrid Seed Corn

JACK MYERS, Eastern Nebraska Public Power District, Syracuse, Neb.

Eighteen different kernel sizes and shapes from one bushel of seed corn! It sounds impossible. But it can and is being done by G. C. Kennedy and his son, Clay, producers of a popular Nebraska brand of certified hybrid seed corn.

Their seed corn drying and grading operation is located at their farm, near Auburn, Neb. Electricity not only helps in drying the corn for safe storage but also powers the elevators, turns the graders, operates the seed treater, and runs the machine used in handling, grading, treating, and bagging the seed corn.

First, the corn is placed in bins, and dried with heated air. The drier unit is oil fired and the blower is powered by a 5-hp electric motor. After drying, the corn is shelled and moved to the seed house. There it is dumped into the elevator pit. That is the last time a shovel is used. Thereafter all handling is done by electrical power or by the power of gravity.

From the elevator pit the corn is elevated to one of four bins atop the seed house for storage. As it is needed for grading, the corn flows by gravity from storage bin back into the pit. The elevator then takes it to the top of the seed house into a smaller holding bin. From there it flows to the aspirator. This machine removes the damaged and light kernels by means of an air blast produced by a blower and a 3-hp motor. From the aspirator the corn flows back to the pit. The elevator picks it up and again takes it to the top of the seed house; this time to the thickness grader. The grader divides the corn into nine different sizes by means of a series of vibrating screens. From the grader each size flows into still another bin atop the seed house until it can be graded.

The length grader, located below the bins, divides the corn into two different lengths. After a treatment of DDT, it is bagged and ready to sell.

Seed house has a capacity of 8000 bu. This year the Kennedys plan to process some 3000 bu.

Peak usage in 1953 came in November when most of the drying and grading was done. Power is furnished by a 5 kva single phase transformer.

Annual Production

3000 bu Seed Corn

Electricity Usage

Annual Consumption—4702 kwhr

APPLICATIONS

TV Replaces Barn Work After Dark

BRUCE FEARN, Philadelphia Electric Co, Jenkintown, Pa

When Lloyd and Sallie Sassaman started farming at Twin Maples Farm near Bedminsterville, Pa. in 1925 they had 10 milking cows averaging about 20 lb of milk per day per cow. Power consisted of one tractor and four horses. The farm was not wired for electricity. Total land tilled was 77 acres. They and one hired man constituted the total manpower. Their work load was a dawn to dark proposition with after-supper chores a regular part of every day.

Continual Work . . . For example, every drop of water had to be pumped by hand. Rain, ice or snow, the cows had to be taken down to the creek for water, twice daily. Cleaning up in back of the cows was another daily job that required a shovel and a strong back. Milking was done by hand. Even with only ten cows it took, on the average, about 1½ hr a day. Milk was cooled in a water tank with spring water which meant, in summer time, a can of milk spoiled every now and then. Then there was "wash up"—cleaning the milking utensils, buckets, strainers and milk cans. This was an after dark job and all the water for "wash up" had to be carried from the house to the barn. Much of the barn work was done at night by lantern light. It took all of this effort just to provide a yield from 10 cows.

If Lloyd was busy, so was his wife Sallie. She had the lanterns and household lamps to fill and clean as a regular chore. And there was the wood stove: such a comfort in the winter time. There is nothing like it to "back up to" when you are cold. But in the summertime, oh boy! It cooked the food and cooked the cook, too. And always there were ashes to carry and wood to cut.

Then Came Electricity . . . The farm was electrified in 1926. Then it was just for lights. But "just for lights" was a giant step. It meant no more cleaning and filling lamps. One chore was forever done and the time saved could be spent for more profitable things. Other improvements followed. After the lights, electricity brought running water; then a washing machine, then refrigeration.

There is an electric milker, an electric milk cooler and an electric water heater in the barn. There are electric ventilators and conveyors and hay driers. The barn is cleaned with electric power. Sallie cooks the meals and dries the clothes with electricity. And after dark instead of chores there's TV.

What has happened to their production since 1925? The Sassamans now till about 172 acres instead of the original 77. They have 40 milking cows producing an average of 40 lb of milk per day per cow instead of 10 averaging 20 lb. The 2000 kwhr per month they use costs much less than one hired man and does many more times the work. Result is more production with same manpower.

Annual Production

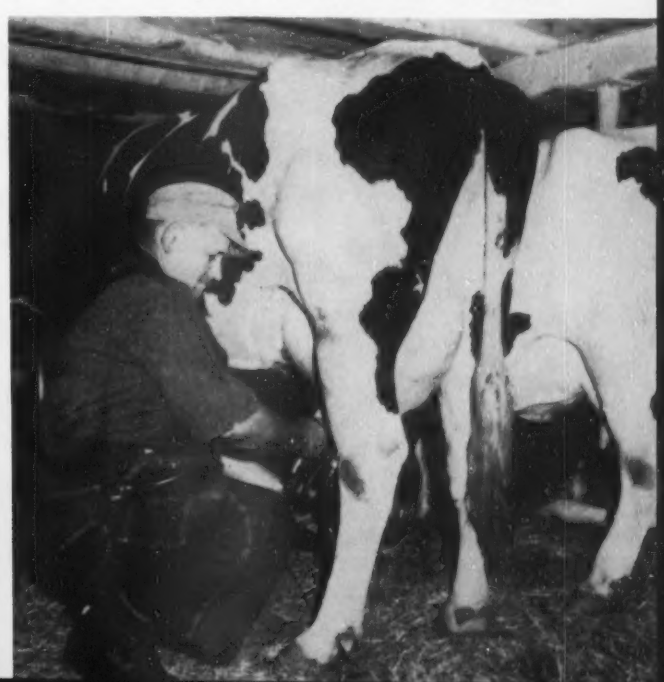
576,000 lb Milk

Electricity Usage

Annual Consumption—24,000 Kwhr

NO MORE 40-QT CANS to lug around with an electrically refrigerated bulk milk tank. Sallie Sassaman's kitchen is all-electric, too

LLOYD SASSAMAN puts milker on one of his high producing Holstein cows. Sassamans use up to 2000 kwhr per month to run their farm



APPLICATIONS

No More Hay Spoilage With Electric Dryer

K. J. McGILDRAY, Alabama Power Co, Eufaula, Ala.

Isham J. "Mr. Ike" Dorsey is sold on his electrical hay curing installation. "It'll do the job, fellows, and there are no 'buts' about it," he said, while pointing to some of the alfalfa hay in the bin, already cured and still green and leafy.

Some years ago row cropping on Dorsey's farm down in Lee County, Ala. gave way to the raising of hay and other foodstuffs for his herd of 100 Black Angus beefers.

Dorsey could see many advantages in the change. Labor costs could be cut to the bone. Both planting and harvesting could be more completely mechanized. It would be easier to market his entire crop as beef than as individual products.

But it didn't quite work out that way. "Mr. Ike" was not long in finding that the farmer's old enemy spoilage was still as active as ever. One year a few days of bad weather at the wrong time wiped out his entire hay crop. Then he came across an article on electrical hay drying in "Electricity on the Farm Magazine," which Alabama Power Co sends to its many farm customers. It started him thinking.

By the time the first cutting of the next year's (1948) crop was ready, Dorsey had finished building a new barn equipped with two large storage bins, two feeding stall that could handle some 50 head of cows at a feeding, and two 26-ton hay mows, each equipped with two electrically operated blowers. His spoilage problems vanished.

Besides his drying installation, Dorsey has a field loader to minimize labor required for harvesting his feed crop. Once the hay is loaded in the field, it is hauled to the barn where a huge fork operated by a 3-hp electric motor puts it into place and moves it as necessary. Electrical time switches, starting relays, devices for checking such important items as temperature and moisture content of the hay all go into making the set-up almost completely automatic. Floodlights in selected locations also enable the farm staff to work 24 hr a day when necessary.

Hay Dryer Production

Capacity—52 tons of Hay per Operation
Drying Time—Five to Six days (excluding heat)

Electricity Usage

Annual Consumption—4,500 kwhr
Connected Load—6.3 kw

LIFT OPERATES with 3-hp motor. In top picture, Dorsey's son "Pete" is at the controls of the lift. In picture at left, "Mr Ike" and son inspect some of the hay that was cured electrically in their barn. Up to 52 tons of hay can be handled per operation by dryer

APPLICATIONS

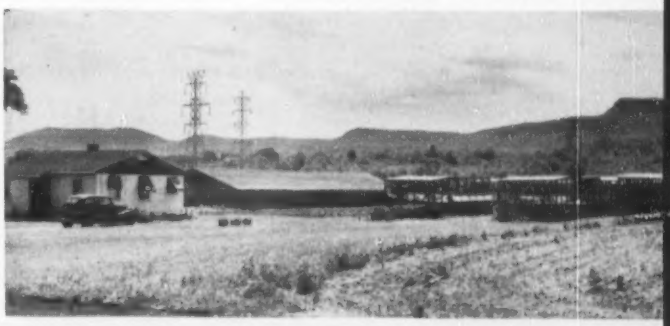
Automatic Equipment Raises Fireman's Poultry

CHARLES F. CHUNGLO, Western Massachusetts Electric Co, Springfield

A life-long ambition to own his own farm, a carpenters' skill, and wide use of electricity have helped Robert W. Adair, an Amherst, Mass., fireman turn an undeveloped 12-acre plot into a highly successful poultry operation.

Twelve hundred laying hens, 1,500 broilers, and 600 turkeys are now raised annually at the Adair farm. Four years ago production was zero. That was when Adair, a trained carpenter, and his father started the project.

Using electric saws and planers they first built two five-room houses. When their families were moved in, they went to work on poultry houses and turkey shelters. Both men hold full-time jobs. Their time is at a premium. Electricity, they realized, was the only way to get full time production on a part time schedule. So into their laying house went completely automatic equipment. There is an automatic poultry feeder, automatic waterers, and automatic lighting to stimulate egg production. Thermostatically-controlled heating cables protect the poultry's water from freezing.



ADAIR'S FARMSTEAD was built completely by himself and his father. Electric equipment was used to build it, and now to operate it

Adair's chicks and turkeys are electrically incubated and later thrive under eight 4-lamp infrared brooders. An electric debeaker prevents any losses from the birds pecking each other. When they reach maturity, an electric semi-scalder and an electric picker dresses them for market. Those not sold at wholesale are stored in a 16-cu ft freezer to supply a small retail trade. The eggs not used for hatching are electrically candled, washed, and graded and sold.

Adair views his four years of accomplishment with satisfaction. Now he plans to install a walk-in cooling room and a freezing room with other equipment to follow.

Annual Farm Production

3¾ tons Broilers
3 tons Turkeys
16,000 doz Eggs

Electricity Usage

Annual Consumption—10,000 kwhr
Connected Load—10 kw

A Little Power Each Day Keeps Apples on Way

J. R. CARROLL, Delaware Electric Cooperative, Inc, Greenwood, Del.

Even with apples, electricity has a job to do.

A case in point is the 100-acre Kratz orchard near Greenwood, deep in Delaware's apple growing country. Here, E. Laird Kratz produces some 20,000 bu a year of eight varieties. Kratz can harvest continuously from July to October, and he relies heavily on electric power for speed in processing and packing his fruit.

Apples first are emptied on a wide conveyor belt which takes them through a series of rotor brushes for cleaning. Next they are screened for size, and then put on a series of rollers for sorting. Another series of elevator and conveyor belts carry them past employees for additional sorting and selection before they are finally put in baskets or boxes and stacked for shipment. Tree spraying also is handled electrically by one man with a tractor-pulled, electric power sprayer. Spraying is started during the dormant stage and continued weekly until harvest.

Kratz' total power demands, while small, are desirable.

Annual Farm Production

20,000 bu Apples

Electricity Usage

Annual Consumption—532 kwhr
Connected Load—2.87 kw

APPLICATIONS

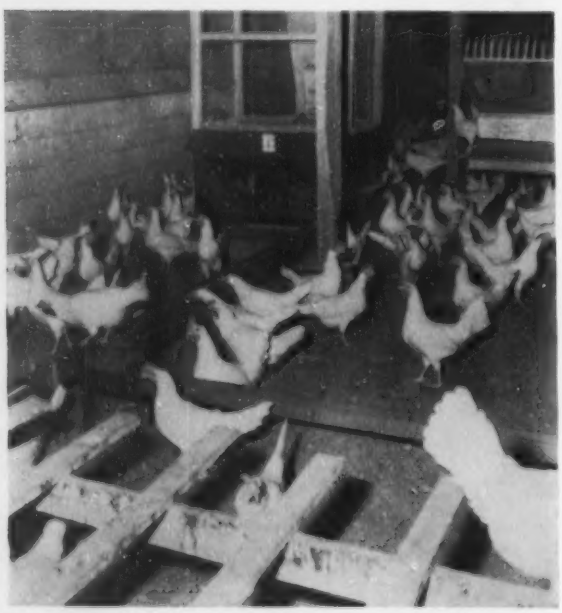
Cafeteria Man Carries Feeding Methods to Farm

M. T. GEDDINGS and E. B. ROGERS, Duke Power Co, Spartanburg, S. C.

Cafeteria feeding methods are carried to the farm by Frank O. Sherrill, Charlotte, N. C., operator of the S&W cafeteria chain. He and farm manager Mack Patton, have combined their talents to put into operation one of the most completely electrified and mechanized agricultural units to be found anywhere in the country at Crail Farm, Sherrill's 300-acre farm near Hendersonville, N. C.

Sherrill has put the cafeteria feeding method in reverse for feeding both the cattle and poultry. Instead of passing the animals by the feed he uses various mechanical devices to pass the feed to the animals.

Electric Motors Handle Feeding . . . The Crail beef cattle feeding operation, with a capacity for handling about 120 animals, involves the feeding of both silage and chopped hay. The silage is cut in the field with a field harvester, hauled in and blown into two 125-ton capacity silos. The blower is equipped with a 10-hp, three phase electric motor. For feeding out of the silos, a portable silo unloader, driven by a 3-hp motor, dumps the silage into an electric scoop-type conveyor. The conveyor then elevates the silage to an endless belt which runs in a feeding trough. This trough extends into and runs the entire 50-ft length down the center of the feeding shed. Belt is driven at variable speeds by a 3-hp motor through a variable speed power transmission unit. Patton says this unit can send up to 2400-lb of silage to the cattle in a single feeding.



CAFETERIA-STYLE FEEDING is Crail Farm feature. Feeding troughs contain moving belts which carry feed around four sides of house

The hay handling is also interesting. Cattle eat from each side of four self-feeding units. These units measure 30x40 ft and each hold about 50 tons of chopped hay. In each bin, the feed is piled 24 ft high on top of steel "A" frames. These frames have cracks along their length so that air can be forced up through the hay. At the end of each frame is an opening for attaching a portable drying unit. The hay, harvested and chopped in the field, is blown into the bins by the same blower used for loading the silos. After loading, the portable dryer (oil-fired with a fan driven by a 5-hp motor) is attached and the barn curing process started. After curing and when the cattle are ready for hay feeding, doors are opened on each side of the barn and cattle eat out of the bins.

Complete Egg Facilities . . . For egg production, Crail is set up to handle the entire operation from chick brooding to final grading, packaging and storing of the final product.

The laying operation is carried on in three 50x120 ft houses each with a capacity of about 2200 layers. Average production is about 414 doz eggs per day. Both the feeding and watering are completely automatic. Feeding troughs, containing a moving belt, carry the feed around the four sides of each house. This feeding system is motor driven and operated by a time switch which predetermines both the time and length of each feeding. Watering is also automatically done with troughs equipped with float valves and overflow pipes. Electric heating tape in the bottom of troughs keeps water at proper temperatures.

The laying houses are well ventilated for maximum comfort to the hens.

As soon as the eggs are gathered they are cleaned with an electrically heated detergent and water solution in an automatic washer. Then they are placed in a refrigerated room equipped with an electric humidifier.

An electric grader which can handle 200 doz per hour sorts the eggs into five sizes. From there they are crated and sent to S&W cafeterias in nine cities of the Southeast.

Annual Farm Production

100,000 doz Eggs
20,000 lb Poultry
100 Hereford Calves

Electricity Usage

Annual Consumption—30,132 kwhr
Connected Load—65.4 kw

Electrical Farming Tip

A silo unloader cuts the time required for throwing down silage from 10 min to 10 sec for a 24 cow herd, reports University of Wisconsin.

APPLICATIONS

Electrified Feed Mill Saves Time and Labor

R. W. BUTTS, Ohio Edison Co, Akron, Ohio

An electrically-operated feed preparation plant is saving time and labor for the three Kaiser brothers of Huron, Ohio and is providing consistently fresh feed for their herd of 350 Hereford cattle.

The Kaisers, Al, Herb and William, designed and built most of the plant themselves. Into it they put 70 hp of electrical equipment complete with remote control switches to perform almost every conceivable kind of feed handling and processing chore.

Feed is moved into the preparation area by conveyors and blowers, ground and mixed in the mixer, and loaded into self-unloading wagons. The wagons then distribute the freshly-milled feed to feed bunkers in the barns. Much labor and time is also saved by not having to make repeated trips to the mill. Then too, the freshly milled and mixed feed is more palatable and has higher nutritional value than feed that has been milled and allowed to stand over a period of time.

During winter the breeding herd receives a ration of ground corn cobs mixed with concentrates and hay. The corn cobs and concentrates are the only ingredients not produced on the farm. A local elevator, anxious to dispose of them, supplies the cobs at no cost. With this type of feeding and the saving of time and labor resulting from the electrically-operated feed preparation plant the Kaiser boys are able to keep their cattle in good breeding condition at an extremely low winter cost.

Electrical equipment for operating the Kaiser's feed mill totals about 53 kw in grinder, mixer, cleaner, conveyors.

5-HP FEED MIXER is just one of the total 70-hp of electrical equipment that goes into operating the Kaisers' feed preparation plant

For Brooding, Grading, Electricity Keeps Egg Output High

L. C. WESSINGER, Georgia Power Co, Augusta, Ga.

Many farmers will tell you they like electric underfloor brooding for chickens. Still others will give reasons why they prefer infrared. J. H. Marshall, of Evans, Ga., will tell you either is good. He uses both.

Marshall has four laying houses on his farm. In some houses he has installed electric underfloor brooders and in others he broods with infrared lamps. His flock of hens now number 7,500, and he is building for 10,000.

Marshall uses electricity in many other ways, too. He has an egg cooling room (designed by C. R. Askew, N. A. R. Lawrence and L. C. Wessinger, all of the Georgia Power Co) and is now planning a freezing room for broken eggs. He also uses an electric grader which can handle 10 cases an hour, and an electric egg washer.

All of his laying houses are well lighted. Clock-controlled lights have the right type of shallow reflectors to assure an even distribution of light throughout the house.

Also operated on Marshall's farm are a completely electrified dairy and a seed cleaning plant. While total electricity consumption for 1953 totaled 33,312 kwhr, he expects soon to use 40,000 to 60,000 kwhr.

Annual Farm Production

3,042 cases Eggs
432,000 lb Milk
12,000 bu Small Grains
300 to 400 tons Hay

Electricity Usage

Annual Consumption—33,312 kwhr
Connected Load—50.95 kw

APPLICATIONS

Kilowatts Keep Busy on Michigan Vegetable Farm

LEE WETHERBY, Consumers Power Co, Jackson, Mich.

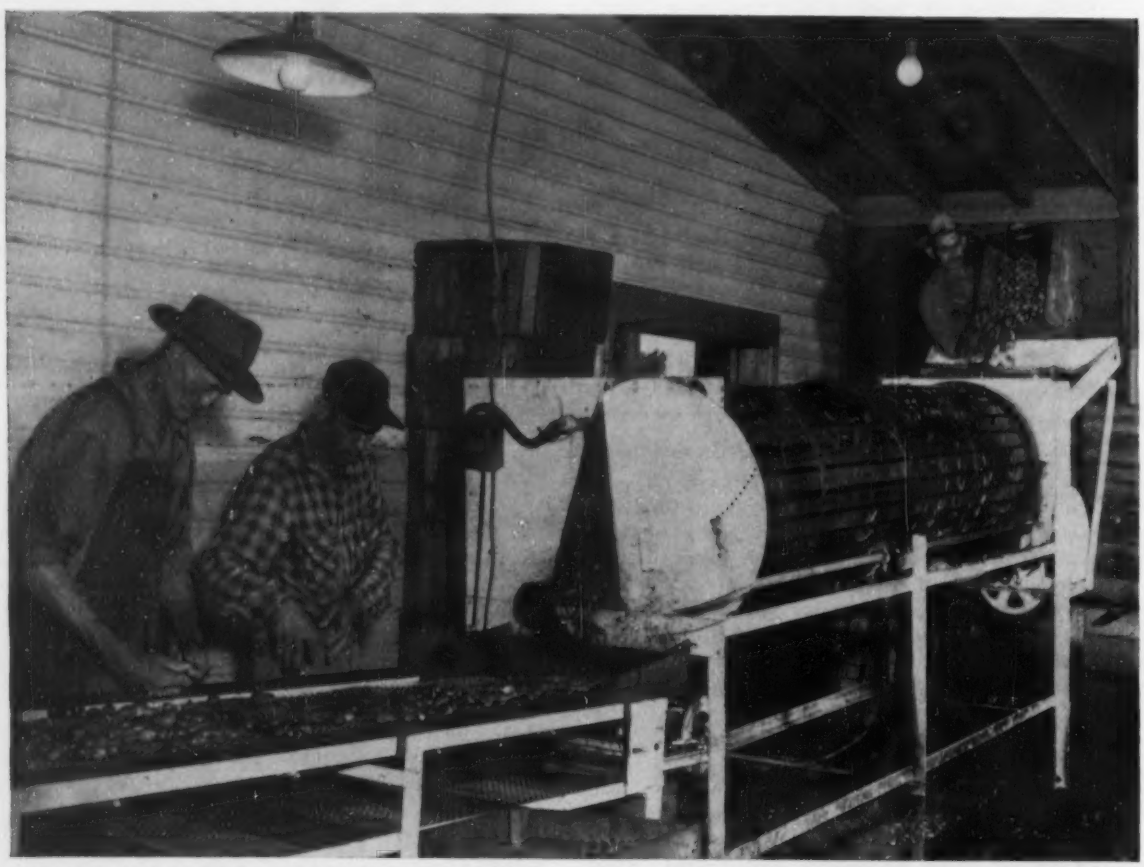
Farming today is far different from what most of us picture it or remember it. A good example is the Lacerne Dixon vegetable farm at Munith, Mich. Last year Dixon used 103,512 kwhr of electric energy to process his vegetable crops. This is as much as 42 average urban homes will use in a year.

In the yard of Dixon's farm stands a transformer bank of two 50-kva power transformers furnishing 3-phase power, plus two 15 kva and one 5 kva single phase transformers. A few years ago this amount of power on a farm would have been called sensational. But today it's only a step in progress. For Mr. Dixon now is planning to install a new 40-hp, 3-phase motor for vegetable irrigating.

Dixon's is a highly productive farm of 1,200 acres located near Jackson, Mich. Some 400 acres of this is muck soil devoted to raising radishes, onions and onion sets. But Hereford cattle and crops such as corn, oats, rye, wheat and hay also are a part of the farming program. Electricity is at work everywhere. It loads and unloads trucks of onions and the other vegetables. It sorts and cleans. It provides refrigerated storage. It helps grade and package. It provides light, heat and ventilation for workers' comfort.

Rapid Handling Electrically . . . On the Lacerne Dixon farm 60 acres of muck land are used for growing radishes. From four plantings each summer they yield an annual harvest of 36,000 bu. Conveyors and elevators speed processing for market.

It's the same electrical story in processing the farm's onions. An average of 96,000 bu per year from 160 acres must be harvested, processed, and packed ready for market. As truck loads of onions are removed from the fields in August and September, they are taken to the



CRATES OF RADISHES are dumped into the hopper (background). Water is sprayed on radishes as they tumble over each other within the revolving drum. Then they emerge onto conveyor (foreground) where employees handpick them as they move on to the packaging machine

drying sheds where they are placed in bulk on slatted floors through which blows the dry, warm outside air. This removes enough moisture from the onions to store them safely until removed for packaging. Ten 42-in propeller fans, operated by ten hp motors supply air to the bins. Each of these fans deliver 29,200 cfm.

Vegetable growing requires a lot of water. A 2-hp and a 5-hp pump supply water from wells to two farm residences, the barns and sheds. In the vegetable washing rooms, a ¾-in hose runs continually at each machine.

Water Drainage . . . But too much water is another thing. Electricity also helps get rid of it. The drainage ditch system around the muck fields is not at a high enough level to allow rapid discharge of water at times of heavy rainfall. So a dam is installed between the river and the ditches and the water is pumped over the dam. Because the lift is small, a large quantity of water can be pumped into the river rapidly allowing the fields to be quickly drained. A 5-hp motor used on a 10-in drainage pump does the job.

Without his electrical equipment Dixon says his farm would still be selling its crops in bulk to be processed and sold in a packing plant many miles away.

Instead he produces a fresher product with less loss which results in a lower cost to the consumer. It allows his crops to be grown and processed in one place with a minimum of hand labor. This means smaller transportation costs, less handling, and a reduction in time between the harvest and the table.

Annual Farm Production

36,000 bu Radishes
96,000 bu Onions
27,000 bu Onion Sets

Electricity Usage

Annual Consumption—103,512 kwhr
Connected Load—157 kw

Things Hum Electrically at Alfalfa Dehydrating Mills

JACK MYERS, Eastern Nebraska Public Power District, Syracuse, Neb.

Dehydration of alfalfa calls for a wide variety of electric motors at the Mead Alfalfa Milling Co and the Skyline Mill near Mead, Neb.

Ranging in size from 3 hp to 150 hp, the motors power everything from conveyors and grinders to blowers and crushers in the intricate process required to turn out high quality alfalfa meal.

Both mills operate in much the same way: green alfalfa is dumped onto a slowly moving conveyor. This conveyor powered by a 3-hp motor, moves the alfalfa back to a cross conveyor. This conveyor drops it into a stem crusher. The crusher, powered by a 20-hp motor, is a roller device which breaks up the material so it will dry faster. Alfalfa must be dried in 40 min or less, or it cannot be labeled "dehydrated".

From the stem crusher the alfalfa is elevated to the top of the drying drum which is kept constantly revolving by a 20-hp motor. A large blower, powered by a 50-hp motor, draws heated air continually through the drum. Baffles within the drum carry the chopped alfalfa to the top. Then, as the alfalfa falls to the bottom, the dried material is drawn out and into the first of two cyclones.

The cyclone is a cone shaped device designed much the same as the dust collectors on hammer mills, only considerably larger. As the alfalfa passes down through the cyclone, it is partially cooled. A second blower with a 15-hp motor draws the alfalfa from the bottom of the cyclone and blows it to the second cyclone. It is necessary to blow the dehydrated alfalfa about 200 ft to make it cool enough to bag after grinding.

Next the dehydrated alfalfa goes to the grinder which is powered by a 150-hp motor. The grinder converts the chopped dehydrated alfalfa to dehydrated alfalfa meal.

After dehydrating the alfalfa meal may be bagged in 50-lb bags as is done at the Mead Alfalfa Milling Co or pelleted as is the practice at Skyline Mill. Both mills start operation as soon as possible in the spring, usually mid May, and operate continuously until frost, usually mid October.

Production

3,000 tons Alfalfa Meal (each mill) per season

Electricity Usage

Annual Consumption:
Mead Milling—230,143 kwhr
Skyline Mill*—221,310 kwhr
Connected Load:
Mead Milling—199.5 kw
Skyline Mill—231 kw

*for nine months; it opened last spring.

Electrical Farming Tip

Barn cleaners cut chore time for the dairyman. Cleaning time can be reduced to less than a minute per day per cow.

APPLICATIONS

"Twilighters" Get Full Production, Electrically

SAM HENRY, Pennsylvania Power Co, Sharon, Pa.

Russell W. Shannon and William K. Yarian of Sharon, Pa. are "twilight" farmers who sandwich in their barnyard chores between shifts at the nearby Westinghouse Electric Corp plant. Since they must continually crowd two full days of work into one, they readily testify to the value of electrical help.

Shannon runs a broiler operation. It originally started as a hobby, but rapidly developed into a full-fledged business. Today he owns two poultry houses with a capacity of 13,000 birds. He has installed automatic waterers and an automatic feeding system with overhead gravity storage bin, thermostatically controlled ventilating fans, and fluorescent lighting. New-born chicks are started in the large buildings and confined to small floor areas. As they progress the space is expanded until the full floor area is used. In 11 to 12 weeks 3 and 4-lb birds are ready for market. Shannon has little manual work once the flock is started. Most of it comes in preparing the houses for the arrival of baby chicks. He is now in the process of laying a new foundation for two more poultry houses thereby doubling his flock. He later may build a small poultry dressing plant.

Yarian operates a 260-acre dairy farm with the help of his son. They milk 30 head of Holstein cows and the son manages a few registered swine and beef as 4-H and Future Farmers of America projects. They have an automatic barn cleaner, running water, thermostatically controlled ventilation, hay drying fan, milk cooler, electric conveyor and milking machines. Yarian says his automatic equipment not only saves labor, but assures maximum production and improved quality. "All of which results," he beams, "in a larger milk check."

Shannon and Yarian are representative of a number of "twilight" farmers in the area who farm electrically, particularly those engaged in dairying and in the raising of poultry.

Annual Farm Production

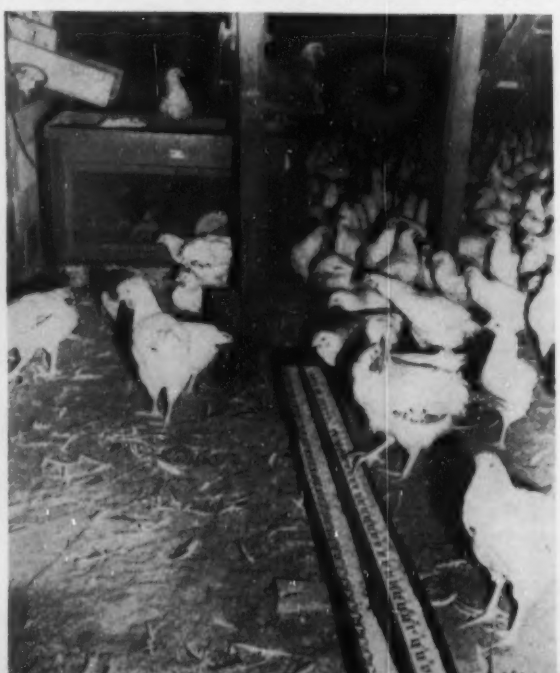
Shannon	Yarian
52,000 broilers (approx.)	29,200 gal milk (average)
	40 head Hampshire ewes
	8 head Hampshire pigs

Electricity Usage

Shannon	Yarian
Annual Consumption—	Annual Consumption—
18,816 kwhr	13,100 kwhr
(including residence)	(including residence)
Connected Load—4.5 kw	Connected Load—13.29 kw

LARGER MILK CHECK comes to "twilight" farmer William Yarian with automatic electric dairy equipment. Yarian holds job off the farm

AUTOMATIC FEEDING SYSTEM saves time and builds profits for busy Russell Shannon who holds a full time job in manufacturing plant



APPLICATIONS

Popsicles Pique Palates, Produce Profits

A. J. RHODES, Louisiana Power & Light Co, New Orleans, La.

Popsicles are producing profits for Green Bros. Dairy who make the frozen confections as an adjunct to their regular dairy enterprise.

And from pasture to pasteurizer, electricity at Green's works hard. It processes, freezes, and packages the popsicles. It milks 90 cows, cools the milk, and transfers it to vacuum-sealed cans without it ever touching human hands. Altogether, some 70 kw in equipment go into operating this highly integrated dairying operation.

Green's pasteurizing plant at Bastrop, La. came as an outgrowth of a family farm they had begun to develop in 1947. In building the plant they wisely decided to make it large enough to handle production from other suppliers as well. They now use milk from 23 nearby farms plus their own to serve 250 retail outlets and 2000 direct customers.

A modern, well-lighted store on the front side of the plant dispenses a full range of dairy products—milk, buttermilk, ice cream specialties, and of course, popsicles. Throughout the area, their products are known for their quality, their place for its cleanliness.

And throughout their business, proudly point out John and Ed Green, "electricity does the job."

ELECTRIC POWERED MACHINERY molds and packages bright red popsicles a popular consumer item at the Green Bros. Louisiana dairy

Electrified Mill Encourages Local Wheat Production

JOHN BRYAN, Alabama Power Co, Roanoke, Ala.

The Parker family, lifelong residents of Woodland, Ala. had always taken their wheat to Austell, Ga. for grinding. It was a long and inconvenient trek. But it had to be done if they were to get their wheat made into flour.

Then J. V. Parker, one of the sons, thought to himself, why not a mill here? He knew of several neighbors who, like himself, had been carting their wheat over to Austell. These farmers would surely patronize a mill in their own community. And other farms might grow a little wheat, too, if a mill could be located close by.

Mr. Parker's farm was ideally located for such a set-up. It was near town, and in the center of a progressive farm section. Power was readily available and Alabama Power Co engineers had offered to help him with the technical problems he would have to face. The idea sounded good.

That was five years ago. Today he operates a mill with a capacity of 50 bu per day which last year ground some 12,000 bushels of wheat grown by farms in four surrounding counties. He operates the mill with two 5-hp motors, a ¼-hp conveyor mechanism, and a ¼-hp cleaner.

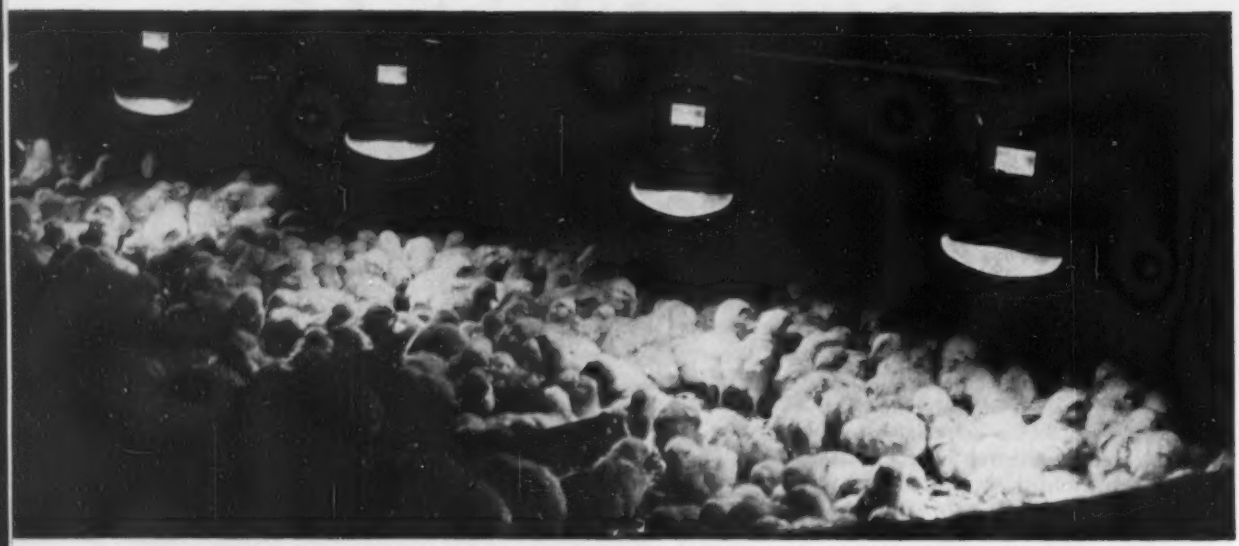
Milling is not Parker's only interest. He runs a thriving poultry business. His pride is a large broiler house equipped with six 1,000 capacity concrete slab brooders. Each is heated by two 800-w electric cables. He estimates his average brooding cost per chick with the slab brooders to be less than 1¢, including lights. Building's supplementary ventilation is provided by four 24-in, ¼-hp exhaust fans installed in dog houses on the roof.

Annual Farm Production

12,000 bu Wheat
24,000 Broilers

Electricity Usage

Annual Consumption—22,500 kwhr
Connected Load—18.6 kw



INFRARED HEAT helps broiler chicks thrive at Walter Gibbs' Alabama farm. Three broiler houses give Gibbs a total capacity for raising 23,000 chicks, and annual production of 92,000. Droppings from his broilers are put on pasture to greatly reduce his fertilizer costs

APPLICATIONS

Diversification, Electricity Up Farm Gross 10 Times

J. L. KENDRICK, Alabama Power Co, Anniston, Ala.

Walter Gibbs will tell you in a hurry that there is something to this business of crop diversification and electrical help. In only five years this Cleburne County, Ala. farmer has sent his gross income soaring from $6,000 to $60,000 per year.

It was five years ago when Gibbs sold 30 bales of cotton from his 170-acre farm to make the $6,000 figure. The next year a national milk concern at Dadeville established a "manufactured milk" route through the section and he was quick to see its possibilities. At that time he had only eleven cows in his herd and not too much pasture. But dairying looked good to him and it appeared that he needed some diversification. So he began building up his dairy herd and converting some of his cotton acreage to pasture land.

In the fall of 1949 he decided to diversify his operation further and ventured forth with a 3,000 capacity broiler house. Again he made money and found that from several standpoints the broiler business fitted in well with his growing manufactured milk program. In the winter of 1950, he put in another 10,000 capacity broiler unit and in the fall of 1951, still another unit of the same capacity. Last year with his herd of 30 dairy cows and his three broiler houses with a capacity of 23,000 chicks, he grossed the aforementioned $60,000. He had trimmed his cotton acreage to ¼ of what it was four years ago and had placed that acreage in pasture. With 100 acres of pasture, he now is able to produce, for all practical purposes, all of the feed consumed by his dairy herd.

The broiler phase of Mr. Gibbs' operation is now fully automatic, complete with electric waterers, thermostatically controlled infrared brooders and an automatic poultry feeder. By applying the droppings from his broilers to his pasture land, he has been able to almost eliminate the use of commercial fertilizers.

Next year Gibbs is contemplating eliminating cotton from his cropping system altogether and substituting soy beans. He believes that he will be able to raise enough of the new crop to combine with corn and thus produce all his own feed (except for concentrates) for his poultry business.

His electric production equipment includes: Brooding, 46 kw; automatic feeder, 2 hp; portable elevator, ⅓ hp; water system, 3⅓ hp pumps; miscellaneous lighting, 3.0 kw; bench grinder, ¼ hp; and milk cooler, ½ hp.

Annual Farm Production

92,000 Broiler Chicks
7,000 gal Milk

Electricity Usage

Annual Consumption—55,000 kwhr
Connected Load—53.8 kw

Electrical Farming Tips

According to USDA, 80% of the nation's commercial farms are family size, and they produce 75% of all farm products sold . . . One kwhr of electricity will wash 1,000 bottles in the milkhouse.

APPLICATIONS

Mechanization Ups Production, Profits, Leisure

CHARLES F. CHUNGLO, Western Massachusetts Electric Co, Springfield

Greater milk production, larger profits and more time for outside activities have been the results of planned electrical mechanization on Silvio V. Rotti's 300-acre Pittsfield, Mass. dairy farm.

Since building a new dairy barn in 1952, this young farmer and his dad have been able to increase their herd from 40 to 60 milking cows and cultivate an additional 100 acres of rented property over and above their own lands.

The Rotti's built most of the cinder and glass block barn themselves. Ventilation is provided by four thermostatically controlled fans and 20 ceiling diffusers. An electric water heater, milking machines and modern lighting increase work efficiency. Electric fly spraying is done in 1/10 of the time required by the hand spraying operation. A radio keeps farmer Rotti up to date on weather and market reports and provides a soothing atmosphere for the cows. Human drudgery in cleaning the barn is eliminated by the electric barn cleaner which does the job in a matter of minutes. An electric clock keeps the men on schedule, and the rapid cooling milk-cooler preserves milk quality.

Mechanization also extends to the farm shop. Time is saved by electric equipment such as a bench grinder, air compressor, drills and soldering iron. An electric portable disc sander is used to sharpen mowing machine blades, cutting the time needed to do this job from 30 min to 10 min. The same disc sander is used in the house for sanding and polishing floors.

Methodical planning and the utilization of labor saving equipment gives Rotti time to carry on side businesses. Among them: buying and selling hay; custom work such as baling, plowing, spraying and field chopping. In addition, he produced and sold 360 tons of grain to other farmers last year. Rotti readily admits he could not do all this work without his electric equipment. His staff consists of two men fulltime and one to do milking.

Annual Farm Production

400,000 lb Milk

Electricity Usage

Annual Consumption—16,000 kwhr
Connected Load—12 kw

Electricity Walks the Bull at This New Jersey Farm

LOUIS FULLER, Public Service Electric & Gas Co, Burlington, N. J.

Ogston farm, near Columbus, N. J. used electricity for chores around the dairy barn as early as 1926. And owner John V. Bishop since has pioneered in the substitution of electric power for manpower. Today the farm's 75 kw connected motor load exceeds that of many industrial plants.

Bishop's electrified operation even extends to exercising his bulls. As many as 12 bulls can be walked at a time, by means of an oval shaped overhead industrial chain conveyor in the bull pen section of the barn. Each bull is connected to the conveyor by a suspended chain that links the overhead conveyor with the bull's nose ring. The conveyor, powered by a 1-hp motor, operates at a speed high enough to make the bulls walk at a brisk pace, but low enough to avoid sore noses.

Bishop's dairy operation at present produces a record 2500 qt of Grade A certified milk daily. Milking is handled by a central automatic milking machine. From there it is pumped to an aerator and refrigerated tank. A series of fenced walkways with remotely controlled gates enables two men to shuttle the cows in and out of the milking room.

Efficient Equipment Use . . . Electric power for silo loading releases all of Bishop's tractors for cutting and gathering silage during the busy harvest season. Instead of using an expensive tractor, Bishop has a wagon-mounted 30-hp electric motor that can easily be moved into position for operating the silo loader.

Electricity does an employee relations job, too. With the rapid growth of industry in the Delaware River Valley, farmers are finding it increasingly difficult to obtain and keep labor. By eliminating many of the drudgeries, Bishop's electrified equipment has made employment on his farm more attractive. He reports little turnover among his 15 fulltime employees.

Annual Farm Production

1,825,000 lbs Milk

Electricity Usage

Annual Consumption–75,000 kwhr
(production equipment)
Connected Load–75 kw
(production equipment)

APPLICATIONS

Electricity Sparks Turkey Output on Plantation

CARROLL W. ANDREWS, Southwestern Gas & Electric Co, Shreveport

Mention a Southern plantation, and most folks will immediately think of cotton and magnolias. But to Southerners these days it could just as well mean turkeys, beef cattle, wheat, corn and alfalfa.

True, the cotton is still there, but modern day plantations have diversity. A good example is the Alden Plantation in Bossier Parish, La. where electric power has helped pave the way for output of a wide range of agricultural products.

In addition to a 300-head herd of Hereford cattle and 775 acres in cotton and food crops, Alden Plantation's owner, Roger E. Wheless, annually produces some 24,000 broad breasted Thompson white turkeys.

An electrified plant processes the birds for sale in the nearby Shreveport market. Some 49.5 kw in compressors chill or freeze them in the plant's refrigerator rooms. Other electric equipment includes scalders, pickers and ventilating fans. There is even a ¼-hp vacuum pump to draw air out of plastic bags in which the turkeys are placed before freezing. Raising the turkeys requires 25 battery brooders with a connected load of 15 kw. They can handle 6,000 day-old birds at a time. A 200-w lamp keeps away intruders like skunks, foxes and other "varmints" when the turkeys go onto the range. A maintenance shop uses such electrical equipment as welders, compressors, grinder wheels and drills.

The entire plantation has 20 electric meters, ten of which are on tenant houses and ten on productive equipment. Electricity consumed monthly for farm production averages 5643 kwhr.

Annual Farm Production

24,000 White Turkeys
(plus Cotton, Live Stock, Grain Crops)

Electricity Usage

Annual Consumption—67,716
Connected Load—68.4 kw
(productive equipment)

THOMPSON WHITE TURKEYS, 24,000 of them, are raised annually on the Alden Plantation where King Cotton has moved over for production of a wide variety of farm products. Plantation uses over 5,000 kwhr a month, measured through 10 meters, to run its equipment

APPLICATIONS

Electric Underfloor Brooding Holds Heat for Hours

J. W. PARRIS, Georgia Power Co, Atlanta, Ga.

"I think it's the *only* kind of brooding."

This is the way S. A. Bennett, Sr., successful Appling, Ga. poultryman, feels about electric underfloor brooding. Bennett's brooding unit consists of a 5 x 5 ft concrete slab in which electric heating cable has been embedded. Ten 4 x 4 ft hovers are placed on top of the slab. The chickens under the hovers enjoy constant, thermostatically-controlled heat. Even in the event of a temporary interruption of power the concrete slab will hold its heat for hours.

White Leghorns of the Babcock strain—4,300 of them—thrive in Bennett's laying house. The house has clock-controlled poultry lights to keep egg production at a maximum.

Bennett also has put electricity to work on other jobs. He has an electric water pump, automatic waterers, an electric egg washer and a grader. He is now making plans for construction of a refrigerated egg cooling room.

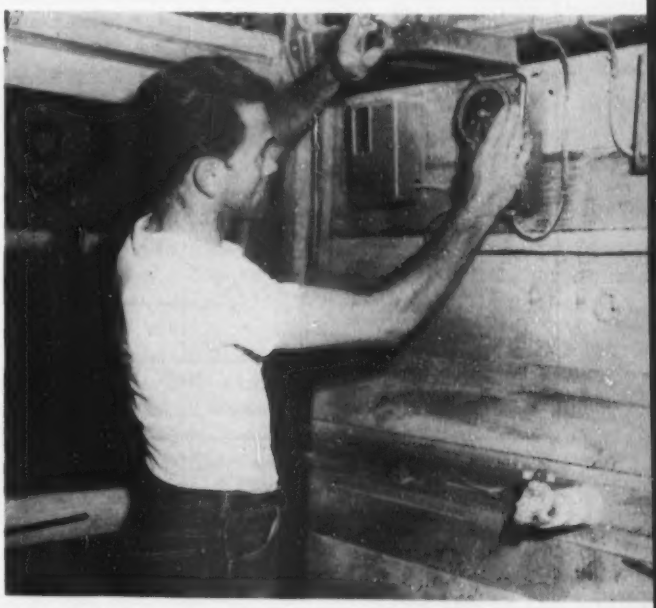
His equipment and connected load includes: 3.2 kw, underfloor brooding; 2.5 kw, laying house lighting; .75 kw, egg cooling unit; .50 kw, freezer unit; 1 kw, water pump; 2.50 kw, egg washers; .75 kw, outside flood lighting; and .50 kw, automatic feeders.

Bennett sells some 1,400 cases of eggs each year. This is 60% production from the 2,500 hens in his flock which are producing.

In addition to poultry, the farm has a herd of from 35 to 40 beef cattle and a small grain crop operation.

Across the highway lives Bennett's son, S. A., Jr. who, like his father, specializes in egg and poultry production. His laying house, besides having automatic time switches to control lighting, is equipped with a "cafeteria-style" automatic feeder. Motion of the feeder, he believes, encourages his flock of 2,000 to eat more than they ordinarily would. Feeder is 260 ft long and will accommodate eight chickens to the foot.

The younger Bennett likewise prefers electric underfloor brooding. "It gets the heat right where you want it," he says emphatically.



TIME SWITCHES control lights in the poultry laying houses. Young Bennett's farm also utilizes "cafeteria-style" poultry feeding methods

HEATING CABLE embedded in concrete slab, makes up Bennett's underfloor brooding unit. Hovers are placed on top of slab

Annual Farm Production

(S. A. Bennett, Sr. farm)

1,200 to 1,400 cases Eggs*
8,000 to 10,000 lb Beef
300 to 500 bu Grain
*60% production from actual laying flock of 2,500

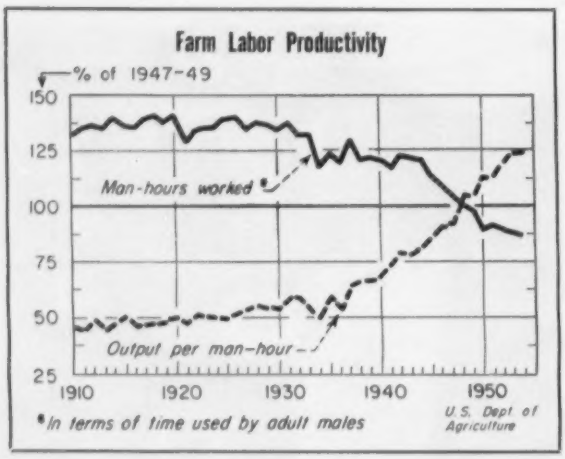
Electricity Usage

Annual Consumption—14,000 to 18,000 kw**
Connected Load—11.7 kw
**Measured through one residential meter

RESEARCH

Needed: More Food from Fewer Farmers

BYRON T. SHAW*



With flexible power—and more of it—modern farms now have tools and equipment unheard of a few years ago. The effect on labor efficiency has been striking. Farmers now put less than half as many man-hours into producing an acre of corn as they did 35 years ago, and less than two-thirds as many hours of work into an acre of hay. They get better yields, too.

In considering the changes taking place, we have to include the remarkable improvement in crop and animal yields during the last 15 to 20 years. New knowledge based on research in using fertilizers and soils, in feeding, in breeding of plants and animals, and in controlling diseases and insects, has given farmers an ability to produce that is unmatched in our history. As a result, some 8½ million workers—one-third fewer farmers than 35 years ago—are producing virtually the same amount of cropland for a population 55% greater. And they're giving us the foods needed for better diets, too. In no other nation today do so few farmers produce so much food and fiber to feed and clothe so many at such a relatively cheap price. (see chart).

Land And Labor Problems . . . These changes have created many problems, both immediate and future. Any look into the future must take into account our rapidly increasing population. Population caught up with our supply of new land some years ago, but we have been able to keep ahead through improved farm practices and by shifting land from feed crops to food crops as tractors replaced horses and mules on farms. Our limited land resources now place a big burden on research.

Population pressures eventually will call for increased production of many commodities. By 1975, for example, increases of major proportions will be needed in beef, pork, eggs, poultry meats, milk, lamb and mutton. Comparable increases will be needed in feed grains and pastures in order to produce the additional livestock from which these foods will come.

Such increased requirements do not mean that farm problems will dissolve. They do mean, however, that we must take into account the demands being generated by population increase as we prepare to do the job that lies ahead. This job is going to require all the knowledge that research can produce be translated into improved practices. This will call for all our old techniques of salesmanship plus some new ones, too.

Still Higher Output Needed . . . When we look at what's ahead, one thing is certain. If present trends continue, farm labor efficiency will have to be improved at a faster rate than our population and food supply requirements increase. Less than 15% of our workers are on farms. The important thing, though, is that the proportion is steadily decreasing. Yet production must keep pushing upward.

How can we get greater output per farm worker? There are, of course, many answers. One promising line of research, for example, is in the practical and economical rearrangement and remodeling of present farm buildings. Improvements can be made in land preparation and tillage equipment. Machines adapted to the harvest of intensive crops such as tobacco, vegetables, and fruit are needed. Suitable machines for pasture improvement and forage crop production must be devised. Chore labor uses up 35% of the work hours on some farms. Here's a fertile field for research. It is a field in which the development of electrical devices can be particularly important.

Let's Get Started . . . Can research and education insure that the food and fiber we will need in the years ahead will come at decreasing cost, with minimum strain upon our land, manpower, and capital, and in accord with the nutritional needs of the people?

The time to begin answering that question is now. The very nature of research is such that if we want to make maximum use of these resources, we have to be looking ahead and anticipating needs. We have to be starting on things now that will be vital a few years from now.

Public research can supply part of the answers that will be needed. Some will have to come from manufacturing and industry. The electrical industry particularly, both equipment manufacturers and power suppliers, has a special opportunity in the development of equipment and electrical applications. Its efforts will enable producers to make use of this convenient type of energy in reducing labor and other costs, or otherwise improving efficiency.

The challenge of the future, it seems to me, is for all of us. The rewards will be an agriculture better balanced to meet the needs of our people, better and broader farm markets for the products of industry, a more stable national economy, and continuing high standard of living.

* Dr. Shaw is Administrator, Agricultural Research Service, United States Department of Agriculture

Finding New Ways To Help the Farmer

TRUMAN E. HIENTON*

Application of electricity to productive work on the five million farms served from rural lines in the United States is a job on which farmers will have the help of federal, state and private research agencies.

Department of Agriculture research work on farm applications of electricity is headed up, but not confined to, the Farm Electrification Section, Agricultural Engineering Research Branch, Agricultural Research Service, with headquarters at Beltsville, Md. Here a limited amount of work is conducted in cooperation with other research branches of the department. The larger part of the research program is conducted cooperatively with 12 state agricultural experiment stations. Manufacturers cooperate in this effort by supplying new or improved equipment and power suppliers cooperate by furnishing special service for experimental work.

Hay Curing . . . Projects planned and conducted by the Farm Electrification Section are designed to answer problems in which electricity may have a farm application. One such problem is that of reducing losses in value of hay during harvesting and storage. These losses include shattering of the leaves and lowering of grade when hay is rained on between cutting and the time it is put in the barn or in stacks.

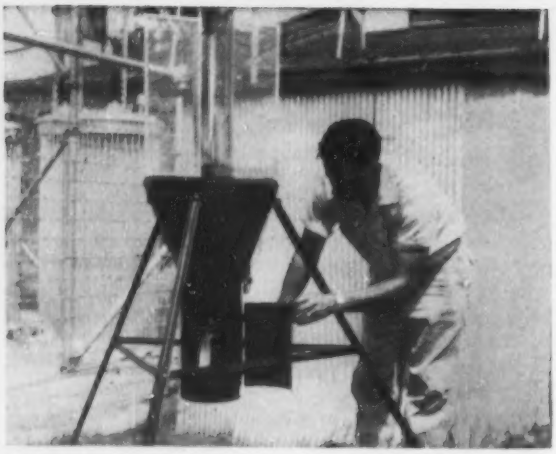
A five-year study has been made at the Agricultural Research Center to provide information on the relative merits of harvesting and preserving forage by different methods under comparable conditions. This study was made by specialists in forage crops, dairy nutrition, hay grading and agricultural engineering. Methods emphasized by this study for avoiding losses caused by rain damage included mow drying of the cut forage or ensiling it after wilting instead of making it into hay.

Agricultural engineers at Beltsville and the Virginia Station working together on studies of air movement produced by motor-driven fans through forage, partially field dried, developed a basis for design of mow-drying or forced-ventilation systems. Several thousand such installations are now in use in the United States.

Handling . . . Use of electric equipment to reduce expensive hand work in livestock production, which still requires more than a third of *all* farm labor, is another problem on which investigational work is concentrated. Farm wage rates today are more than four times those prevailing in the 1935-39 period. Use of electric machines or devices in feeding and other livestock operations is important to the livestock producer both for efficiency and economy. Cooperative work with the Illinois Agricultural Experiment Station has resulted in development of equipment that will remove ear corn from a crib, grind it, and deliver it to a storage bin or feed bunk merely by the push of a button. Similarly, shelled corn and such small grains as

* Dr. Hienton is Head, Farm Electrification Section, Agricultural Engineering Research Branch, Agricultural Research Service, U. S. Department of Agriculture.

INFRARED LAMPS now provide heat during and after farrowing of pigs. A research development, they reduce deaths from chilling, crushing



ELECTRIC TRAPS used for surveys of insect abundance already have helped southern farmers by warning of coming armyworm infestations

oats and barley can be metered along with a protein supplement into a feed grinder in fixed amounts where it is mixed as it is ground, then delivered by blower to a storage bin, all without the use of hand labor. Further investigations are underway to improve certain elements in the system such as the metering or blending device.

Replacing hand labor in honey handling from the bee yard to the container ready for sale is a problem being attacked in cooperative work with the bee culture research specialists of USDA and the University of Wisconsin. Substitution of infrared lamps for steam heat to melt the wax removed in uncapping has improved control of this operation and lessened the danger of lowering quality in the honey. Labor in operating the extractor that separates the wax and honey in the comb has been reduced by development of a satisfactory control. It consists of a time clock and variable voltage transformer which eliminate the periodic need for an operator to change the speed.

Tobacco Curing . . . Shortages of labor for cutting wood used as fuel in curing brightleaf tobacco grown in the Carolinas, Virginia, and Georgia during World War II created a curing equipment problem. Cooperative investigations with the North Carolina Agricultural Experiment Station have improved the efficiency of curing equipment and provided new knowledge. A loss of 1,410 tobacco barns in North Carolina from fire in 1946 was reduced 66% in three years by development of improved curing equipment and electric controls combined with safety regulations. Studies are currently being made to improve curing efficiency by forced circulation of air through the leaves and by moving the leaves through the air.

Insect Traps . . . Protection of growing crops against insect damage presents an ever recurring problem to farm operators. The possibility of attracting night-flying adult insect moths and beetles to electric lamps and destroying them is being studied cooperatively with research entomologists of USDA and workers in the agricultural experiment stations of Indiana, Virginia and Texas.

Many important insects have been found to be attracted in large numbers to lamps that radiate much of their energy in the near ultraviolet or blacklight region of the spectrum. The use of such lamps and traps to capture insects is becoming of value for survey purposes to determine when insects emerge and their abundance. During 1954 their use in Louisiana, Mississippi, and Tennessee gave forewarning of heavy impending armyworm infestations and enabled farmers to prepare control measures.

Pig Brooding . . . Another farm problem that has received research attention is that of using electric heat to reduce losses of young pigs from chilling. Studies by USDA about 15 years ago in cooperation with the Purdue University Station showed that electric brooding of pigs in the early spring reduces death losses by 17.4% or an average of 1.5 pigs per litter. Commercial development of the infrared lamp since that time has provided a more satisfactory heater. Such lamps located above the farrowing area during and for several hours after the birth of the pigs and then over a protected corner of the pen are now helping many farmers to reduce losses from chilling and crushing. These lamps are also used with farrowing crates and to heat pig incubators.

Stock Watering . . . Providing an adequate supply of drinking water for hogs economically during freezing weather is a problem of concern to all hog raisers, particularly in northern states. This need was emphasized in cooperative investigations conducted with the Iowa station to determine the desirable temperature of drinking water for hogs during cold weather. During one test fattening hogs drinking from automatic waterers gained an average of 10 lb more per animal in six weeks of below freezing temperatures than those in similar lots drinking from unheated troughs filled by hand twice daily. These tests showed that more economical operation can be obtained by use of a waterer equipped with a thermostat than without such control, since water temperature in excess of 45F gave no additional gain.

Refrigeration . . . Another problem of interest to many farmers, as evidenced by many letters of inquiry was the design and development of a general purpose farm refrigerator that would provide large space for freezing or for cool storage of farm products. In response, plans for a general-purpose, two-temperature farm refrigerator have now been made generally available through the Agricultural Extension Service. These plans were developed through studies of existing units throughout the country and the construction and field testing of new designs in cooperation with research specialists in Home Economics, USDA, and the State Agricultural Experiment Stations in Texas and Washington.

Other problems relating to use of electricity in farm production for which answers are required are being investigated. The heat pump or reverse cycle refrigeration, for example, may have other applications than for heating the farm house in winter and cooling it in summer. Electromagnetic radiation may increase seed germination or destroy insects or plant diseases. Brooding of chicks with infrared lamps or other infrared systems has possibilities for saving labor in chick raising but also has some limitations that may be reduced or eliminated by further research. Electricity may eventually be applied in many other ways on the farm as research and development studies provide satisfactory solutions of requirement, design, and operational problems.

What Are State Experiment Stations Doing in Research?

BARTON C. REYNOLDS*

You will note research included in the following breakdown, many times lists states working in a highly coordinated manner, on *different aspects* of a problem. It may appear at a glance that there is considerable duplication of effort. This is far from the truth. Due to the wide variations in climate, soil, topography, and even people and their habits, each state must find its own answer.

The list is as follows:

Land Development

Water supply sources and forecasting amounts available.
Arizona, Arkansas, California, Maine, Minnesota, Montana, New Hampshire, New York (Cornell), Oklahoma, South Carolina, and Utah.

Methods of water application and water removal, including system designs.
Alabama, Arizona, Arkansas, Florida, Idaho, Illinois, Indiana, Iowa, Kentucky, Maine, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New York (Cornell), North Carolina, Oklahoma, South Carolina, South Dakota, Utah, and Washington.

Water requirement of crops and response obtained.
Alabama, Arizona, Arkansas, Colorado, Florida, Idaho, Illinois, Indiana, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Hampshire, New York (Cornell), North Carolina, Oklahoma, Pennsylvania, Puerto Rico, South Carolina, Utah, Washington, West Va.

Management of irrigated soils.
Alabama, Arizona, Arkansas, Colorado, Florida, Idaho, Illinois, Indiana, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New York (Cornell), North Carolina, Oklahoma, Puerto Rico, South Carolina, Utah, Washington, West Virginia.

Pumps and pumping plants.
Arkansas, Illinois, Indiana, Kentucky, Maine, Missouri, New Hampshire, New Mexico.

Structures, Machinery and Equipment

Processing, handling and storing of seeds and grain.
Alabama, California, Florida, Georgia, Illinois, Indiana, Iowa, Louisiana, Minnesota, Mississippi, Nebraska, New York (Cornell), North Dakota, Ohio, Pennsylvania, Texas, Vermont, West Virginia.

Processing, handling and storing of forages and silage.
Alabama, Alaska, Connecticut (Storrs), Illinois, Indiana, Louisiana, Massachusetts, Maine, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York (Cornell), North Dakota, Pennsylvania, South Dakota, Tennessee, Texas, Vermont, West Virginia, Wisconsin.

Processing, handling and storing of root crops.
Florida, Idaho, Louisiana, Maine, Minnesota, Nebraska, New Jersey, New York (Cornell).

Processing, handling and storing of special crops.
Massachusetts, Oklahoma, Texas.

Studies of electrical equipment for farm processes.
Idaho, Minnesota, North Dakota.

Determination and establishment of proper environmental conditions for seeds and grains.
Alaska, Arkansas, Minnesota, North Carolina, Oklahoma, Texas.

Determination and establishment of proper environmental conditions for forages and silage.
Kansas, Michigan, New Jersey, North Carolina.

Determination and establishment of proper environmental conditions for poultry.
Connecticut (Storrs), Delaware, Hawaii, Illinois, Maine, Massachusetts, Mississippi, New Hampshire, North Dakota, Pennsylvania, Washington, West Va.

Determination of proper environmental factors for other farm animals.
California, Illinois, Indiana, Missouri.

Development of feeding, cleaning and crop handling processes.
Idaho, Illinois, Kansas, New York (Cornell), West Virginia.

Development of plans and equipment for packing houses and processes for farm products.
California, Georgia, Michigan, Mississippi, Tennessee.

Production, processing, curing, handling, and storing of tobacco.
Kentucky, Maryland, North Carolina.

Apple harvesting, handling, grading, and storage.
Indiana, Maine, Massachusetts, Washington.

Control of insect pests of farm crops.
Mississippi, North Carolina, South Carolina.

Studies of freezing of food products.
Michigan, Pennsylvania.

Sanitation and water supply studies.
Missouri, North Dakota, Oklahoma.

It is suggested that you contact the Directors of the Experiment Stations in the states that are studying the problems of interest to you. Since many of the projects must be continually studied, they may not always be able to provide you with final answers. On the other hand, you will find all of the directors willing to share what information they can. And they will welcome your ideas for future studies.

* Mr. Reynolds is Experiment Station Administrator, Agricultural Engineer, Agricultural Research Service, Office of Experiment Stations, U. S. Department of Agriculture.

"Much Obliged"

Grateful acknowledgment is extended by Electrical World and by "Electricity on the Farm Magazine" to the following power companies and rural electric co-operatives whose interested helpfulness in furnishing data and other material made possible this study of farm electrification:

Adams Electric Co-op, Inc
Adams Electrical Co-op
Alabama Power Co
Anoka Co Co-op L&P Ass'n
Appalachian Electric Co-op
Appalachian Electric Power Co
Arizona Public Service Co
Arkansas Power & Light Co
Atlantic City Electric Co

Bangor Hydro Electric Co
Black River Electric Co-op
Blue Ridge Elec Membership Corp
Bossier Electric Membership Corp
Bowie-Cass Electric Co-op Inc

California Electric Power Co
California Oregon Power Co
Caney Fork Electric Co-op
Carolina Power & Light Co
Central Alabama Electric Co-op
Central Electric Co-op
Central Hudson Gas & Electric
Central Illinois Light Co
Central Louisiana Electric Co, Inc
Central Maine Power Co
Central Missouri Electric Co-op
Central Power & Light Co
Central Vermont PS Corp
Choptank Electric Co-op
Cincinnati Gas & Electric Co
Citizens Electric Corp
Clark Rural Electric Co-op
Coahoma Electric Power Ass'n
Colorado Central Power Co
Columbus & So. Ohio Elec Co
Co-Mo Electric Co-op
Connecticut Light & Power Co
Connecticut Power Co
Consolidated Gas, Electric Light & Power Co of Baltimore
Consumers Power Co
Corn Belt Electric Co-op Inc
Craighead Electric Co-op

Davie Electric Membership Corp
Deep East Texas Electric Co-op Inc
Delaware Electric Co-op Inc
Detroit Edison Co
Duke Power Co

East Central Electric Ass'n
Eastern Iowa Light & Power Co-op
Eastern Nebraska Pub Pwr Dist

Farmers Electric Co-op Inc
Farmers Rural Electric Co-op
Florida Power Corp

Georgia Power Co
Georgia Power & Light Co
Gibson Co Elec Membership Corp
Grayson Rural Electric Co-op Corp
Grundy Electric Co-op Inc
Guernsey-Muskingum Elec Co-op
Gulf Power Co

Hartford Electric Light Co
Haywood Elec Membership Corp
Holston Electric Co-op
Houston Lighting & Power Co
Howell-Oregon Electric Co-op Inc

Idaho Power Co
Illinois Power Co
Indian Electric Co-op Inc
Inland Power & Light Co
Inter-County Rural Electric Co-op

Jackson Co Rural Elec Co-op Corp
Joe Wheeler Elec Membership Corp

Kansas Gas & Electric Co
Knox County REMC

Lake Superior District Power Co
Louisiana Power & Light Co
Louisville Gas & Electric Co
Lynn Gas & Electric Co

Madison Gas & Electric Co
Magic Valley Electric Co-op Inc
Meade Co Rural Electric Co-op
Mecklenburg Electric Co-op
Meri-Wether-Lewis Electric Co-op
Middle Tennessee Electric Membership Corp
Metropolitan Edison Co
Mississippi Power & Light Co
Mississippi Valley Public Service Co
Missouri Utilities Co
Montana Power Co

NEGEA Service Corp
New England Electric System
New Jersey Power & Light Co
New Orleans Public Service Inc
New York State E & G Corp
Nodak Rural Electric Co-op Inc
North Arkansas Electric Co-op Inc
Northern Electric Co-op Ass'n
Northern States Power Co
Northwestern Public Service Co
Northwestern Rural Electric Co-op

O&A Electric Co-op
Ohio Edison Co
Oklahoma Gas & Electric Co
Otter Tail Power Co

Pacific Gas & Electric Co
Pacific Power & Light Co
Pea River Electric Co-op
Pee Dee Electric Membership Corp
Pennsylvania Power Co
Pennsylvania Power & Light Co
Pennyrile Rural Electric Co-op
Philadelphia Electric Co
Pickwick Electric Co-op
Pioneer Rural Electric Co-op
Portland General Electric Co
Presque Isle Electric Co-op
Public Service Co of Colorado
Public Service E & G Co
Public Service Co of Indiana Inc
P S Co of New Hampshire
Public Service Co of New Mexico
Puget Sound Power & Light Co

Randolph Elec Membership Corp
Rochester Gas & Electric Corp
Rockland Light & Power Co

St Joseph Light & Power Co
Salt River Rural Electric Co-op
Sam Houston Electric Co-op
San Diego Gas & Electric Co
Sand Mountain Electric Co-op
Savannah Electric & Power Co
Shelby Electric Co-op
Shenandoah Valley Electric Co-op
Sho-Me Power Corp
Sierra Pacific Power Co
Southeast Colorado Power Ass'n
Southern California Edison Co
Southern Colorado Power Co
Southern Illinois Electric Co-op
Southern Maryland Electric Co-op
Southwest Arkansas Electric Co-op
Southwest Electric Co-op
Southwestern Rural Electric Ass'n
Southwestern Electric Co-op Inc
Southwestern Gas & Electric Co
Southwestern Public Service Co
Sterns Co-op Electric Ass'n

Talquin Electric Co-op Inc
Texas Power & Light Co
Toledo Edison Co
Tombigbee Electric Power Ass'n
Top O'Michigan Rural Electric Co
Tri-County Electric Co-op

Union Electric Co of Missouri
Upper Cumberland EMC

Valley Electric Membership Corp

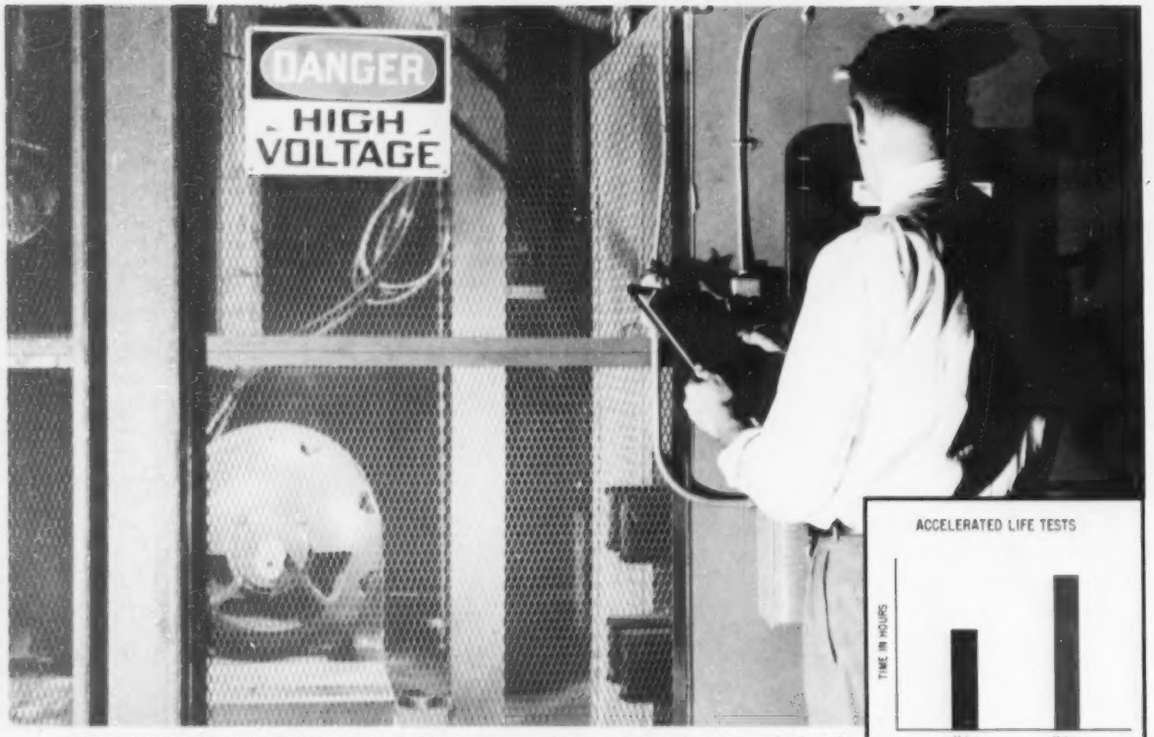
Walton Electric Membership Corp
Western Massachusetts Electric Co
West Florida Electric Co-op Ass'n
West Penn Power Co
Western Light & Telephone Co Inc
Wisconsin Electric Power Co
Wisconsin Hydro Electric Co
Wisconsin Michigan Power Co
Wisconsin Power & Light Co
Woodruff Electric Co-op Corp
Wright Hennepin Co-op Elec Ass'n

HIGH-POTENTIAL TESTS HELP PROVE . . .

NEW INSULATION MAKES G-E MOTORS LAST 50% LONGER

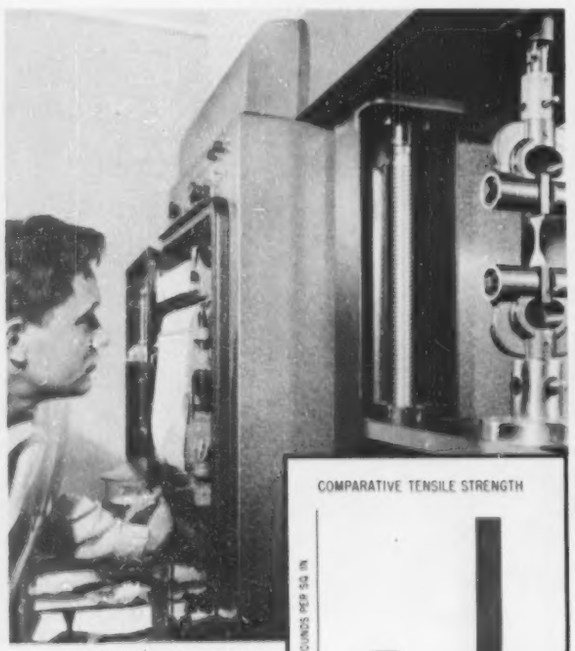
See Details Inside

50% LONGER MOTOR LIFE



IN ACCELERATED LIFE TEST, General Electric's new Polyex insulation proved that it could take extreme heat aging and mechanical stress. Here is a summary of test results...

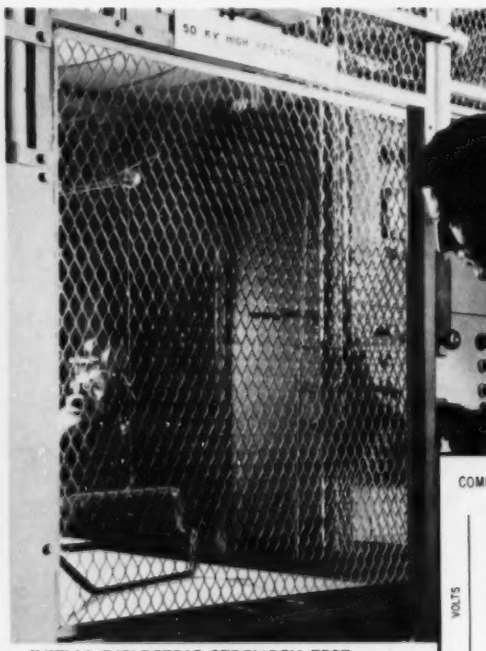
7 TIMES GREATER PHYSICAL STRENGTH



TENSILE STRENGTH of new insulation offers a greater protection against physical stress.

CUT-THROUGH STRENGTH, seven times greater than conventional insulation, is another reason for long life.

50% MORE DIELECTR



INITIAL DIELECTRIC STRENGTH TEST measures insulation's ability to withstand operating and starting voltages, and the protection offered against insulation failure.

An engineering achieven

General E
That is

REVOLUTIONARY *POLYEX* IN
OF THE AMAZING PROPERTIES O

General Electric has developed a complete new Class A insulation for form-wound co which lasts 50% longer than other insulations use today. Its greater ability to withstand phy ical and thermal stresses provides an add margin of protection that will mean tremendo savings to you because of reduced motor failu and maintenance costs.

POLYEX INSULATION is a balanced system polyester films and fibres, together with n hydrocarbon resins. Materials in new Poly insulation have high dielectric and physi

vement of vital importance to users of motors with form-wound coils . . .

Electric Develops New Insulation for Motors
s 7 Times Tougher, Adds 50% to Motor Life

X INSULATION TAKES FULL ADVANTAGE
IES OF NEW POLYESTER FILMS AND FIBRES

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strength. For the first time, the cotton and paper-based tapes and sheets in conventional insulations have been eliminated.

RESULTS OF EXHAUSTIVE TESTS on new Polyex insulation are summarized on these pages. Insulation qualities like these offer you tremendous savings in motor maintenance and a greater degree of service continuity than ever before possible.

GENERAL ELECTRIC RESEARCH for better insulation is a continuing program. Polyex insulation is the latest result of that program. Three years of intensive development and testing of materials and manufacturing techniques culminated in the most significant advance in large motor insulation in 45 years.

POLYEX INSULATION IS NOW AVAILABLE in many ratings of General Electric induction motors in the range of 100 to 3000 HP—and at no extra cost.

YOUR G-E SALES REPRESENTATIVE has complete information. Contact him at your nearby General Electric Apparatus Sales Office. *General Electric Company, Schenectady 5, New York.*

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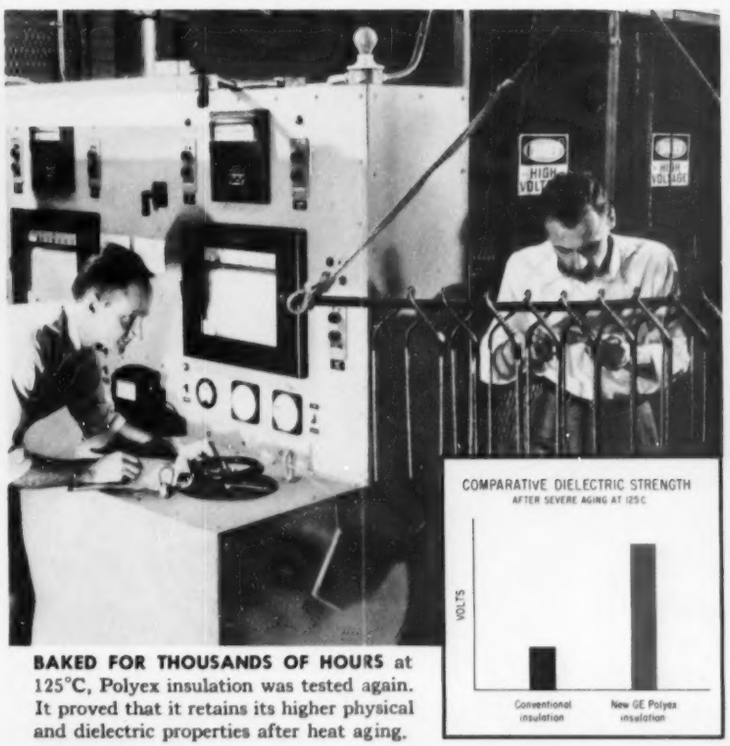
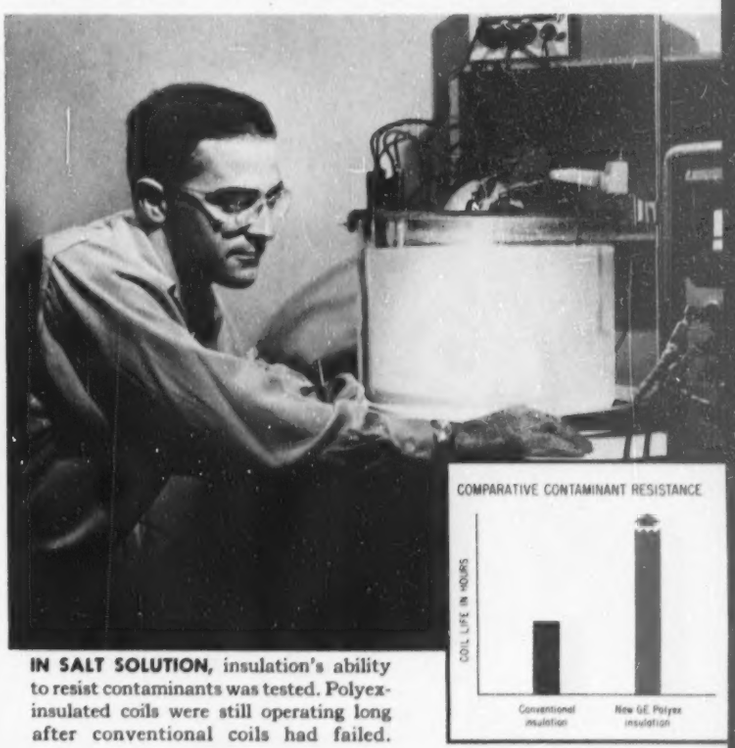
ECTRIC STRENGTH, EVEN AFTER HEAT AGING



BAKED FOR THOUSANDS OF HOURS at 125°C, Polyex insulation was tested again. It proved that it retains its higher physical and dielectric properties after heat aging.

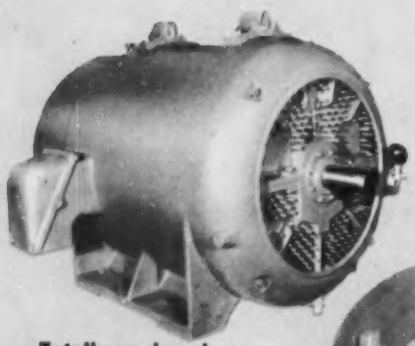
CONTAMINANT RESISTANCE DOUBLED



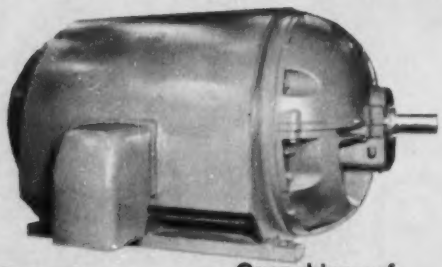
IN SALT SOLUTION, insulation's ability to resist contaminants was tested. Polyex-insulated coils were still operating long after conventional coils had failed.

NOW AVAILABLE IN MANY RATINGS OF THESE G-E INDUCTION MOTORS

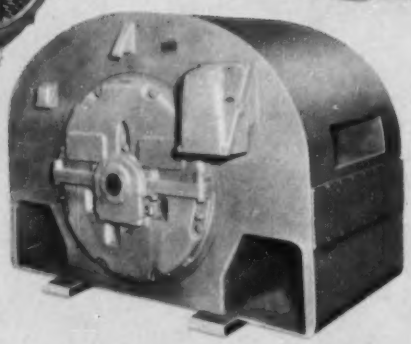
(Approximately 100 to 3000 hp)



Totally-enclosed fan-cooled

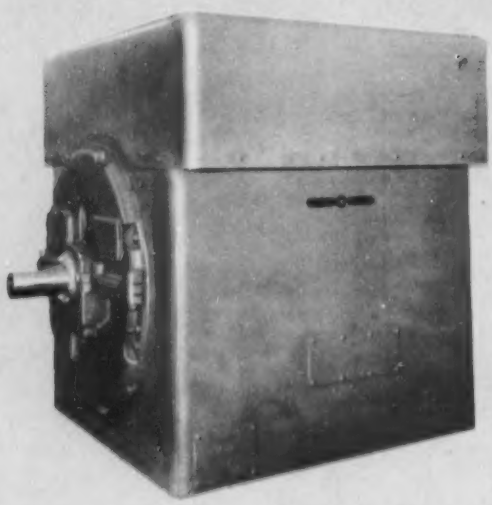


Open dripproof

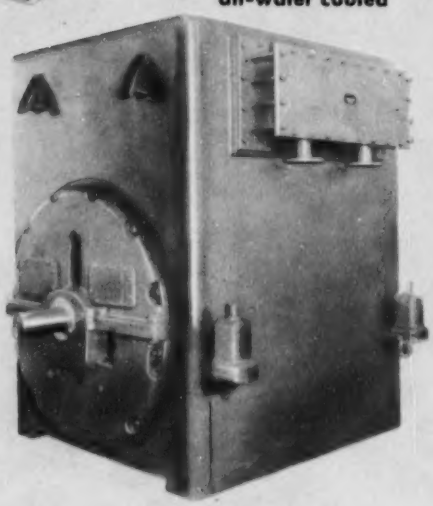


Grade-mounted weather-protected

Base-ventilated weather-protected



Totally-enclosed air-water cooled



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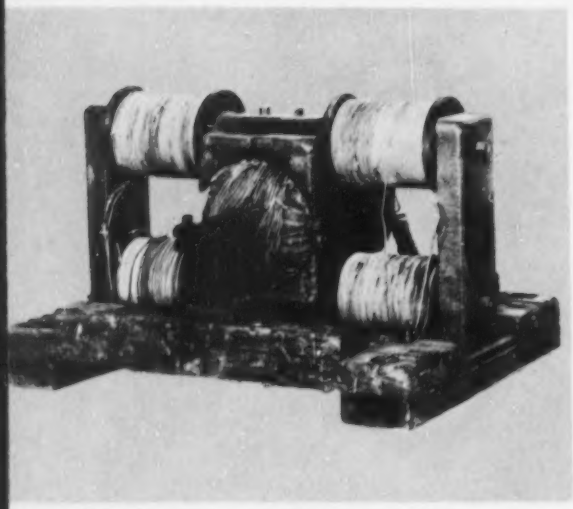
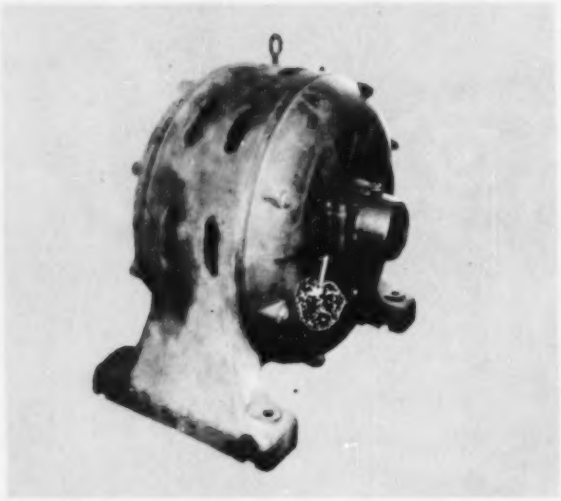
HIGH-POTENTIAL TESTS HELP PROVE . . .

NEW INSULATION MAKES G-E MOTORS LAST 50% LONGER

See Details Inside

THE THIRD MAJOR STEP IN THE EVOLUTION OF FORM-WOUND MOTOR INSULATION SYSTEMS





1878—FORM 1 INSULATION SYSTEM

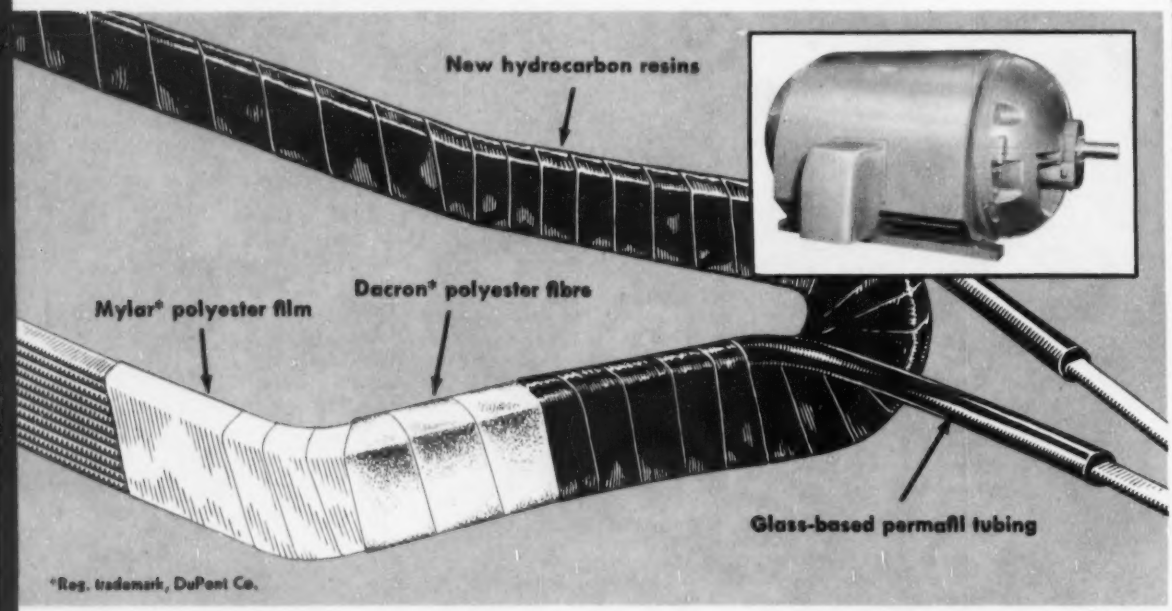
Air was the insulator in early motor coils. Cotton was wrapped around the coils, but served only as a spacer to provide an air gap. The cotton wrapping itself was worthless as an insulator.

1910—FORM 2 INSULATION SYSTEMS ESTABLISHED

Linseed oil was added to cotton to provide insulating qualities. Since then, varnish and other insulating materials have replaced oil, but until now the basic concept has remained the same.

1954—G.E. INTRODUCES FIRST FORM 3 INSULATION SYSTEM

New G-E Polyex insulation becomes the first Form 3 insulation system. Made of polyester films and fibres, Polyex is the first insulation in which the materials have natural insulating qualities of their own.



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GENERAL ELECTRIC

830-14

Want to keep this information? Tear along perforated edge.

Spray Irrigation Contacting Lines May Endanger Farmers

E. S. MORTIMER, Manager of Operations, Eastern Shore Public Service Co of Maryland, Salisbury, Md.

Spray irrigation may be hazardous to farmers if a highly contaminated water stream contacts high-voltage lines before breaking into droplets. If the contact is beyond the stream's break-up point, no degree of contamination nor voltage level will result in hazard. These are results of recently completed tests by The Eastern Shore Public Service Co of Maryland.

For the experiments a ⅞-in. irrigation nozzle, one of the largest used for rotating spray irrigation, was fastened rigidly to a base plate. Nozzle elevation was set for about 30 deg, which is normal for actual irrigation use.

A pressure meter and by-pass valve were installed just back of the nozzle, and connection was made by a 2-in. fire hose to a pipe supplied by a high-pressure pump with intake from a creek. An auxiliary suction from a brine tank was provided to permit increasing the salinity of water. And a bleed-valve permitted sampling the solution for salinity and conductivity tests. Nozzle pressure on all tests was 100 lbs.

To simulate conductors, three strain buses at 10, 20, and 30 ft elevations were installed between two poles. A 66-kv potential transformer with an adjustable autotransformer in the 110-v side was placed near one pole.

SPRAY IRRIGATION TESTS were made to determine if a hazard existed that would affect either present irrigation operators or future efforts to obtain transmission right-of-ways

One 66-kv bushing was connected to the three buses, while the other was connected to ground.

A milliammeter was placed in the grounded 66-kv lead to measure current passing through the water stream. A 1,000-ohm-per-v voltmeter was connected between the nozzle base plate and ground to measure ground potential at the nozzle.

Four sets of tests were performed, under conditions shown in the table. They were made with the nozzle either 50, 30, or 18 ft from the poles and stream directed at either the 30-, 20-, or 10-ft elevation bus, respectively. Different voltages were applied and salinity of the water was changed. The fourth test differed from the preceding three in that the nozzle was changed from a ⅞-in. size to a 13/32-in. size.

Test results were compared with generally accepted data that indicates 60-cps currents of less than 1 ma are not felt by humans, less than 15 ma gives painful sensation of shock, and over 15 ma results in loss of muscular control. The results show:

1. With a ⅞-in. nozzle and lines energized at 69 or 138 kv no hazard

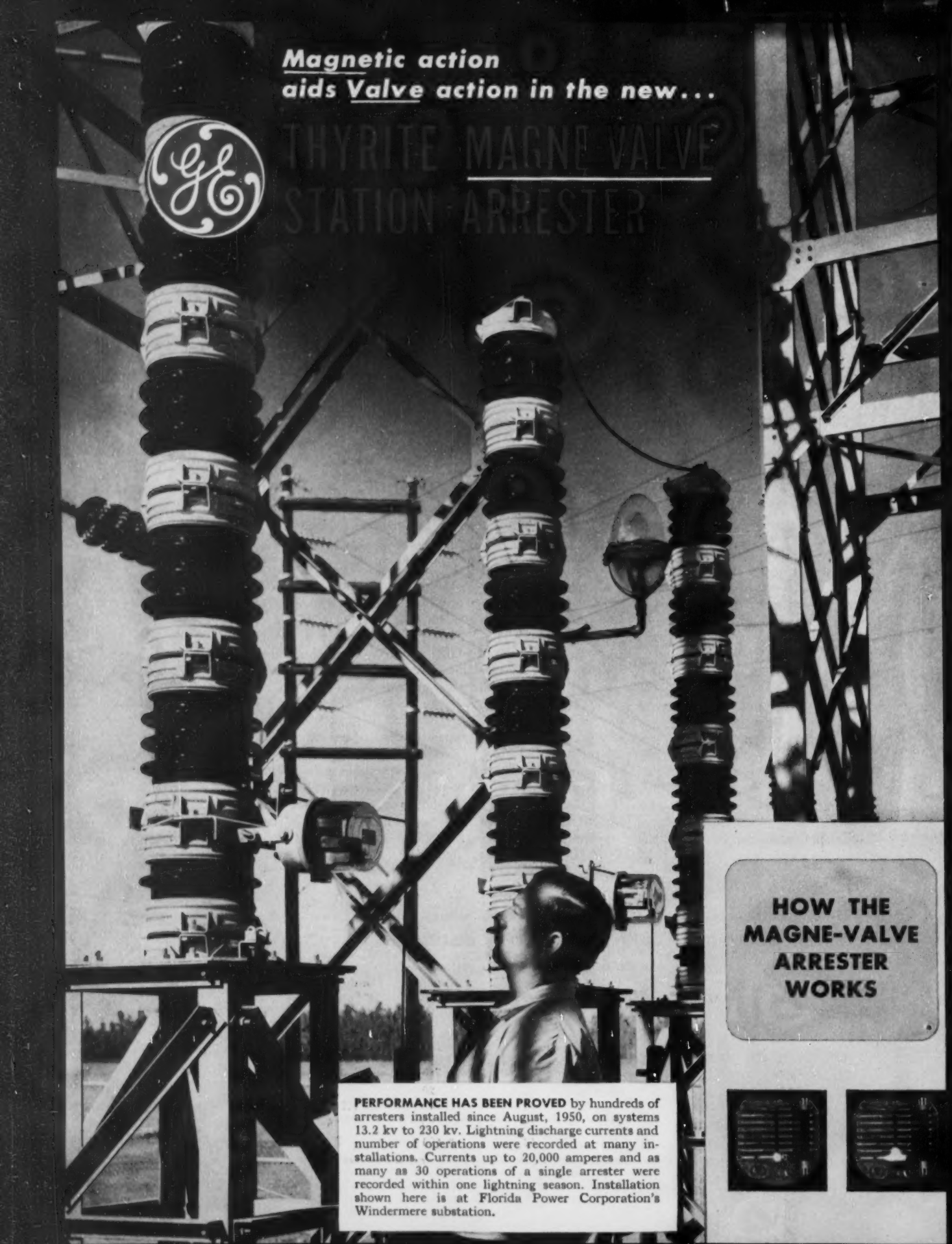
(*Continued on page* 148)

Test Results of Contaminated Water Stream Contacting Energized Conductors

Test No.	Nozzle Size In.	Distance From Nozzle to Poles Ft	Bus Contacted by Water Stream Ft	Voltage From Bus to Gnd Kv	Salinity of Solution Parts per Million	Conductivity of Solution Micromhos	Leakage Current ma	Nozzle Potential V
1A	7/8	50	30	42	20	36	< 1	< 10
1B	7/8	50	30	72	20	36	< 1	< 10
1C	7/8	50	30	42	720	1,250	< 1	< 10
2A	7/8	30	20	42	20	36	< 1	< 10
2B	7/8	30	20	42	740	1,200	>20	>250
3	7/8	18	10	42	20	36	< 1	< 10
4	13/32	18	10	42	2,600		< 1	< 10

Magnetic action
aids Valve action in the new...

THYRITE MAGNE-VALVE STATION ARRESTER



PERFORMANCE HAS BEEN PROVED by hundreds of arresters installed since August, 1950, on systems 13.2 kv to 230 kv. Lightning discharge currents and number of operations were recorded at many installations. Currents up to 20,000 amperes and as many as 30 operations of a single arrester were recorded within one lightning season. Installation shown here is at Florida Power Corporation's Windermere substation.

HOW THE MAGNE-VALVE ARRESTER WORKS

20% better protective level
3 times greater endurance

The new Thyrite* Magne-valve arrester is a major advance in reliability of co-ordinated protection of station apparatus. Let's appraise it!

FOR APPARATUS HAVING STANDARD BIL'S—

You get an unprecedented margin of protection that assures co-ordinated protection for many times higher stroke currents—even 100,000 amperes. This super-protection is especially valuable where lines or substations are not shielded or where practicable shielding may not be infallible.

You get an extra margin of protection which tends to offset adverse effects of separation between arrester and apparatus—enabling co-ordinated protection to apparatus at greater distances from the arrester.

FOR H-V APPARATUS HAVING REDUCED INSULATION—

You get as large a margin of safety in protecting 1-step reduced BIL insulation as was heretofore possible only when protecting full insulation (standard BIL). Hence, the new arrester enables a more positive approach toward reduced insulation and resulting tremendous savings in apparatus investments.

FOR DRY-TYPE TRANSFORMERS—

You get a good margin of protection—heretofore limited. Although oil- or askarel-filled transformers are distinctly preferable for connection to lines exposed to lightning, the decidedly lower impulse strength of dry-type transformers can now be better protected.

FOR APPARATUS HAVING DEPRECIATED INSULATION—

You get more positive protection—to preserve and greatly extend the operating life of old but important apparatus.

**Reg. Trademark of General Electric Co.*

FOR AC ROTATING MACHINES—

You get as good margin of protection to even impedance-grounded neutral rotating machines using ungrounded-neutral 100% rating arresters, as was heretofore practicable with only grounded-neutral 80% rating arrester. And for grounded-neutral machines, you can now limit the lightning stresses to 80% of the machine's 1-minute hi-pot test level. Both are important achievements for better protection of generators, synchronous condensers, and motors, alike.

FOR ALL THESE APPLICATIONS—

You get full-fledged uncompromised *station* arrester protection—6-inch diameter low-resistance Thyrite valve-disk with exclusive integrally fired ceramic insulating collar, the most efficient valve element ever offered.

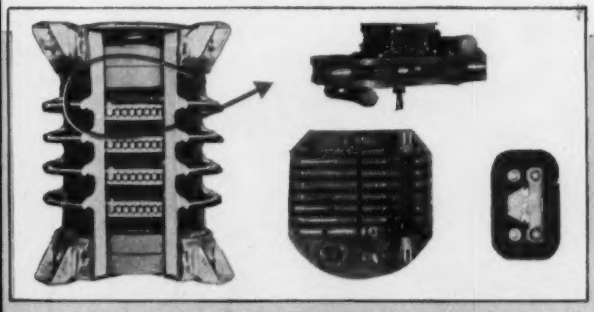
You get straight-in-line, low-resistance discharge path—28 sq. inches of cross-sectional area, with no tortuous up-and-down impedance.

You get over 3 times greater discharge capacity and thermal endurance—plenty of "guts" for withstanding high lightning currents, multiple lightning strokes, long-duration lightning discharges and severe switching surges.

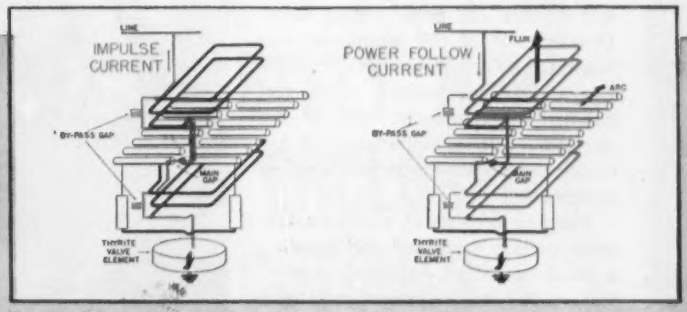
You get greater endurance now—and it protects you for future increasing discharge duty on station arresters attending trends to higher voltage lines, longer lines, greater lengths of cables, and more shunt capacitors, which increase the stored CE^2 energy in switching surges.

For more information about this new station arrester, get in touch with your nearest G-E Apparatus Sales Office or write for Bulletin GEA-1304 to Section 432-5, General Electric Company, Schenectady 5, N. Y.

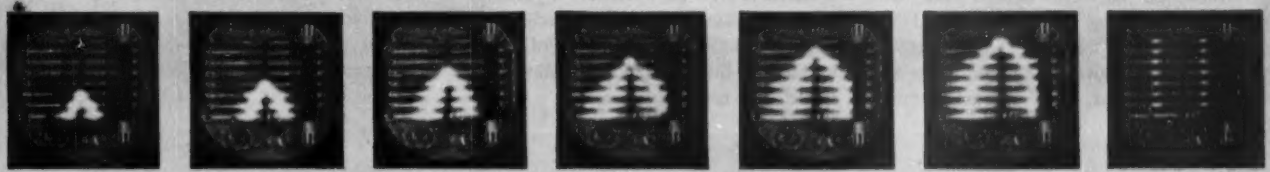
GENERAL ELECTRIC



Cut-away view of new arrester showing new gap units and their components. Gap unit (circled in red) consists of 7 pairs of adjacent gap electrodes within the field of 2 magnetic coils. One pair of electrodes constitutes main gap which controls impulse sparkover sensitivity; other pairs of electrodes form multigap path for arc-interruption of the power follow-current.



Sketch at left shows path of lightning current. Each coil has a pre-ionized shunt gap that by-passes lightning current to the discharge path shown in red. Sketch at right shows path of 60-cycle power follow-current. After lightning sparkover, the 60-cycle power follow-current flows through the coils, as shown in red, creating magnetic flux. Arrows indicate direction of magnetic flux and blowout motion of arc, which motion is the same for either polarity of the 60-cycle follow-current wave.



Film strip (from high-speed movies) shows how magnetic force sweeps power follow-current arc progressively from main gap (see extreme left) to as many as 14 multigaps in series (see second from extreme right) for efficient arc-interruption in less than a half cycle. The arc-path moves so rapidly that even hundreds of interrupting operations cause no harmful scarring or burning of gap electrodes.

Spray Irrigation

(*Continued from page* 145)

exists if the nozzle is 50 ft horizontally from the line, regardless of degree of water contamination.

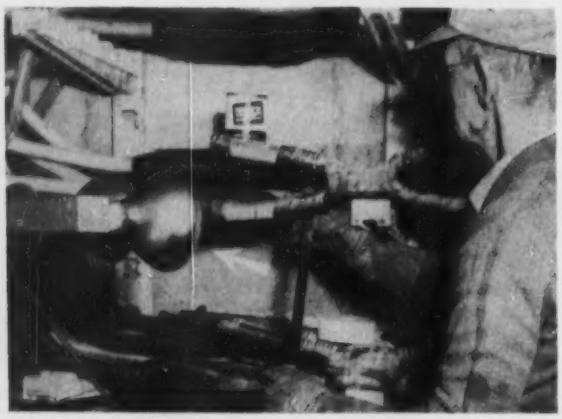
2. With a ⅞-in. nozzle 30 ft horizontally from the line no hazard exists with low-contamination of water, but hazard does exist as contamination is raised.

3. With a 1¾-in. nozzle no hazard exists on any possible proximity to 69-kv lines with safety code ground clearances, regardless of contamination.

The basic conclusion is that the point at which the water stream breaks into droplets relative to where the stream contacts the line is the deciding factor. If the stream-to-line contact is beyond the breakup point, no voltage level nor contamination degree will result in hazard. However, if the contact is ahead of the breakup point, a high degree of contamination will result in hazard.

Heat Lamps Aid Cable Splicing in Cold Weather

G. W. UNANGST, District Meter Supervisor, Appalachian Electric Power Co, Charleston, W. Va.



HEAT LAMPS aid splicing by warming the joint and splicer's hands

Heat lamps have facilitated cable splicing in manholes, in transformer vaults, or on transformer platforms during cold weather. With the use of such heat, better splices are obtained because the joint and tape can be warmed. Also splicers can do a better job when their hands are warm, and they can work under comfortable conditions.

The method of providing warmth is safe, clean, and in most cases available with little work or expense.

Heat lamps have been found to be best adapted when their sockets have swivel joints and large spring clamps. These parts permit attaching the lamps to insulated cables, brackets or other substantial supports, and directing the heat rays on the joint to be spliced. Lamps can also be mounted in groups of four on a tripod.

Reel Hauler and Pulling Truck Aids Cable Work

B. W. HAFELI, Engineer, Underground Lines, Detroit Edison Co, Detroit, Mich.

Cable pulling operations have been facilitated by Detroit Edison Co with a self-contained, mechanized cable reel handler and cable pulling truck. Development of this equipment was prompted by experience with the company's first mechanized cable reel handler. Development was in cooperation with manufacturers of hydraulically powered material handling equipment.

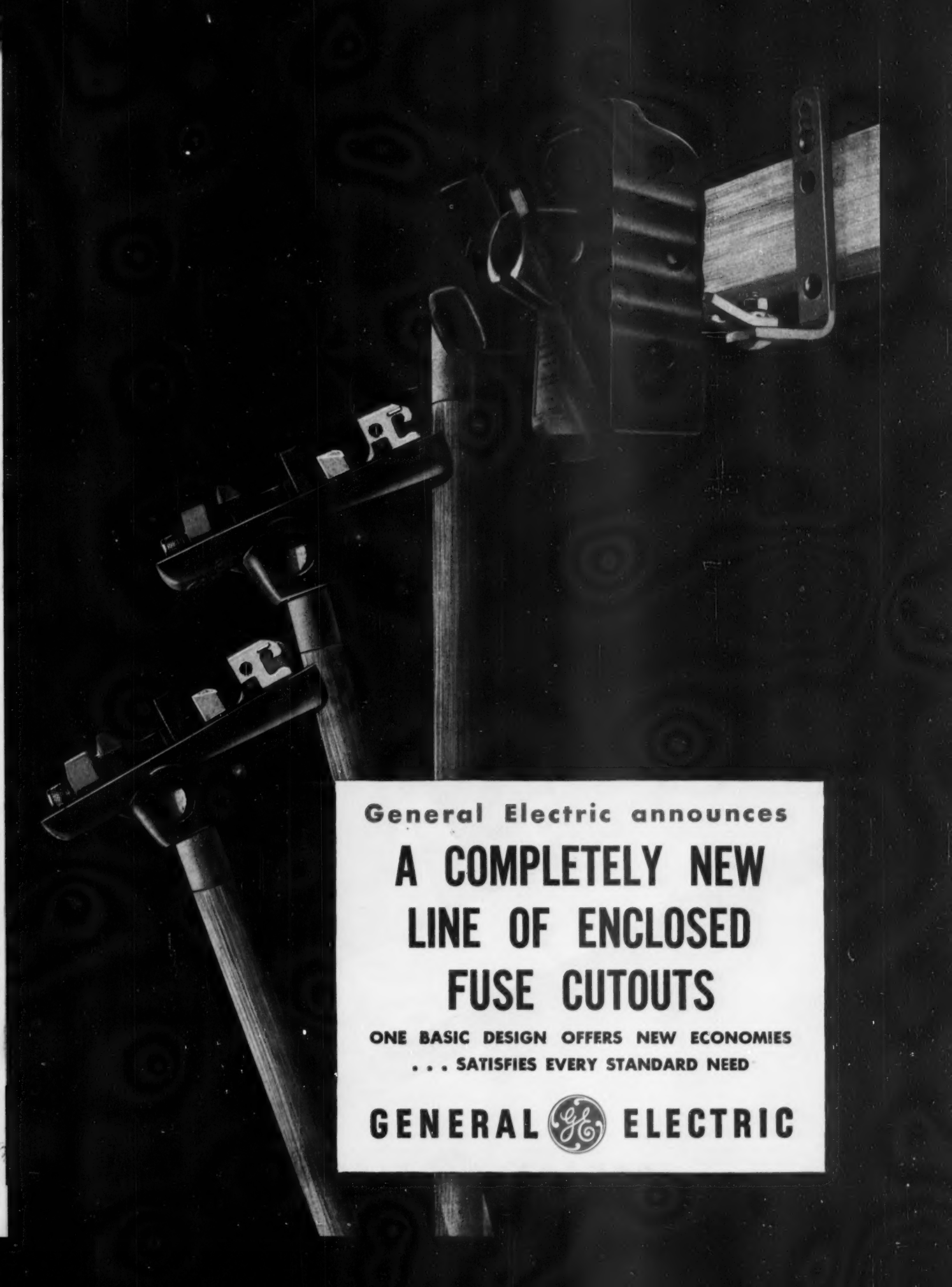
The unit consists of a combination cable pulling truck and reel handler, a small two-wheel equipment trailer, and an industrial-type station wagon for transporting the crew.

The truck is a 165-in. wheel-base, heavy-duty cab-over-engine type having a winch with horizontal drums mounted directly behind the cab. Reel handling unit is mounted immediately to the rear of the winch. It consists of a rotating bed, two reel pick-up arms, and a reel rotating mechanism, all of which are hydraulically operated. Lifting capacity of the pick-up arms is five tons, and reels up to 82-in. chime diam can be raised and rotated.

REELS UP TO 82 in. chime diameter can be raised and rotated to the truck bed. Lifting capacity of the two reel pick-up arms, which are hydraulically operated, is about 5 tons

The cable pulling unit gives an excellent account of itself where a self-contained unit is needed to do the work. In case of a trouble job where

(*Continued on page* 156)



General Electric announces

A COMPLETELY NEW LINE OF ENCLOSED FUSE CUTOUTS

ONE BASIC DESIGN OFFERS NEW ECONOMIES
. . . SATISFIES EVERY STANDARD NEED

GENERAL ELECTRIC

ONE BASIC DESIGN COMBINES ALL

NORMAL-DUTY, INDICATING OR DROPOUT DOOR
can be easily converted on-the-job from semaphore indication of blown fuse to dropout action of door after blown fuse, by the simple removal of converting bar.

NORMAL-DUTY INDICATING NON-DROPOUT DOOR.
Semaphore provides positive visual indication of blown fuse and is specifically designed for those users who desire the *non*-dropout operation—in which the door remains closed after a blown fuse.

HEAVY-DUTY DOOR, (or extra-heavy-duty door)
is indicating non-dropout type. It is particularly applicable at system locations where high or extra-high short-circuit currents can occur.

DISCONNECT DOOR
with hinged blade, has continuous current rating double that of standard fuseholder door—combines maximum safety with ready accessibility.

GENERAL ELECTRIC

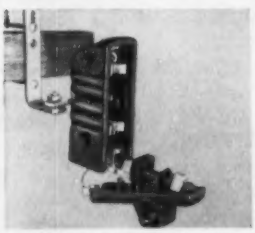
STANDARD FUSE CUTOUT FUNCTIONS

General Electric's new line of enclosed fuse cutouts is the most important cutout development since G.E. first introduced the family concept in 1935. Besides the functional advantages described on the opposite page, the new G-E enclosed fuse cutout gives you all the features most engineers and linemen have wanted. G-E sales engineers and specialists collected hundreds of reports about the things users preferred most. These user preferences were carefully analyzed and built into the new cutout before its design was approved.

Currently available in ratings of 50 amperes, 5.2 and 7.8 kv, this new line will soon include a 100 ampere rating in both voltage classes. For more information get in touch with your nearest G-E Apparatus Sales Office or Agent. Or write for Bulletin GEA-6208 to General Electric Company, Section 433-7, Schenectady 5, New York.

New General Electric cutouts have the features engineers and linemen prefer

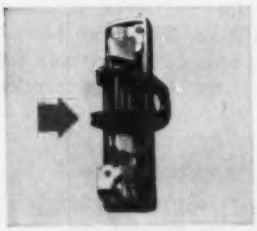
ENGINEERS PREFER:



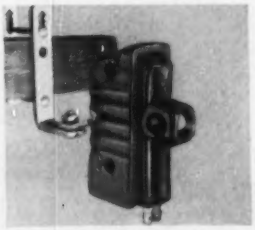
CONVERTIBLE-IN-THE-FIELD FROM INDICATING NON-DROP-OUT TO DROPOUT

COMPRESSION CLAMPING OF HANGER SUPPORT GIVES MAXIMUM MECHANICAL STRENGTH

V-WEDGE CONTACTS COMBINE ALL THE REQUIREMENTS FOR LONG SERVICE LIFE



SNUG FITTING NEOPRENE BARRIER HELPS PROTECT AGAINST INTERNAL FLASHOVERS



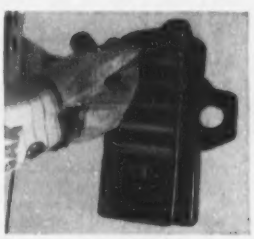
FLIP-OUT SEMAPHORE GIVES CLEAR INDICATION OF BLOWN FUSE

LINEMEN PREFER:

SAFETY GRIP DOOR FOR FUMBLEPROOF HANDLING WITH CONVENTIONAL SWITCH-STICK OR GLOVED HAND

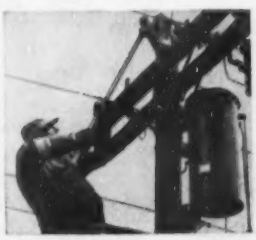
PLASTIC TO METAL LATCHING BANISHES DOOR BINDING

FUSING IS EASY



EASY TO CONNECT

HINGED DISCONNECT BLADE GIVES VISUAL INDICATION OF OPEN OR CLOSED CIRCUIT



CAN'T MISS CLOSING OF DOOR

Cable Pulling Tension in Ducts

DONALD W. BOSWORTH, Cable Engineer, Long Island Lighting Co., Mineola, N. Y.

Straight Duct . . . Calculation of cable pulling tension for a straight horizontal duct section requires that the designer know: (1) weight of the cable to be installed, (2) coefficient of friction between cable sheath and duct material, and (3) allowable tension in psi at point of attachment. If the cable pull is to be made using a woven wire grip over the cable sheath, the allowable tension will be limited to the tension the sheath will safely withstand. If the cable pull is to be made using a cable pulling eye or bolt attached to the cable conductor, the ultimate tension must not exceed the elastic limit of the conductor. The designer should always specify the cable pulling compound, or duct lubricant to be used, as this is a factor in determining the coefficient of friction between the cable and the duct.

Curves in Duct . . . Where duct sections include curves, the following calculation is used. It is based on Bullard's formula for converting curved duct sections into equivalent straight duct sections, in terms of equivalent feet.

$$(1)\quad L = L'(e^{Ka} - 1) + (R/K)(e^{Ka} - 1 - Ka) + L''$$

Where

- L = Equivalent straight length (feet) for curve
- L′ = Equivalent straight length (feet) from cable feed point (man-hole) to the point of curvature.
- e = Naperian logarithmic base = 2.718
- K = Coefficient of friction between the cable sheath and duct
- a = Angle in radians
- R = Radius of curve in feet
- L″ = Arc length in feet

Substituting Ra for L″, the formula reduces to:

$$(2)\quad L = (e^{Ka} - 1)(L' + R/K)$$

This expression is made comparatively easy to operate, through a nomograph prepared for some specific value of K. In this case K = 0.7 the coefficient for lead sheathed cable and concrete duct.

Example . . . How to use the nomograph. An outline shows a typical duct installation where cable is to be pulled from the manhole to the riser.

DESIGN BASIS:

A. Limiting type and size cable which would be installed in the duct will be 3/c-500 Mcm, 15-kv PILC (10.3 lb per ft cable weight).

B. Maxi. pulling tension (T_{max}) is limited to 5,000 lb per sq in. copper cross section. However to allow for deviations from plan in construction, the design is 80% of 5,000 lb, or 4,000 lb.

C. T_{max} = 4,000 lb (3* × 500,000) (7.854 × 10^{-7}) = 4,700 lb. (*If three 1/c-500 Mcm cables are used, this factor would be 2 assuming the entire stress on two conductors).

D. L_{max} = 4,700/(0.7 × 10.3) = 650 ft.

CALCULATION OF PULL

1. Allow 50 equivalent feet for reel drag at the cable feed point.

2. Determine L′ to the entrance (P.C.) of the first bend (Reel drag plus A).

3. Enter nomograph on the R scale at the proper radius and trace diagonally up to the L′ coordinate, then vertically to the central angle, then horizontally to the L scale and read equivalent feet.

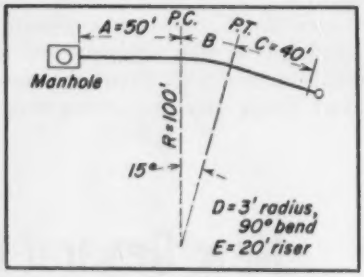
(For B: R = 100 ft; L′ = 100 ft; angle = 15 deg; read 50 ft.)

(For D: R = 3 ft; L′ = 190 ft; angle = 90 deg; read 380 ft.)

Direction of pull shall be from manhole to riser.

Section	Feet
Reel drag	50
A	50
L'_1	100
B	50
C	40
L'_2	190
D	380
E* 20 ft/0.7	29
(* Vertical pull)	
Satisfactory pull	599

This value of cable pull is satisfactory because it is less than the 650 ft design value.



Plan for duct run and cable pull

Remarks. Some companies require duct systems designed so cable may be pulled in either direction. Policy governing permissible pulling tension using a pulling eye attached to the copper conductor, or conductors, varies from 5,000 psi, or 5,000 lb maximum (the lower tension being limiting), to 7,500 psi, without further restriction. One company arbitrarily limits cable pull to 550 equivalent feet.

Where cable pulls are made using a woven wire grip for attachment to the cable sheath, the generally accepted practice is to limit the sheath stress to 1,500 psi for commercially pure lead, or 2,000 psi for arsenical lead. Design should be based on the limiting cable likely to be installed in a system rather than the cable to be installed initially.

The method outlined neglects such refinements as weight correction factors, where more than one cable is pulled into a single conduit; and side wall pressure, which may be limiting on short radius bends.

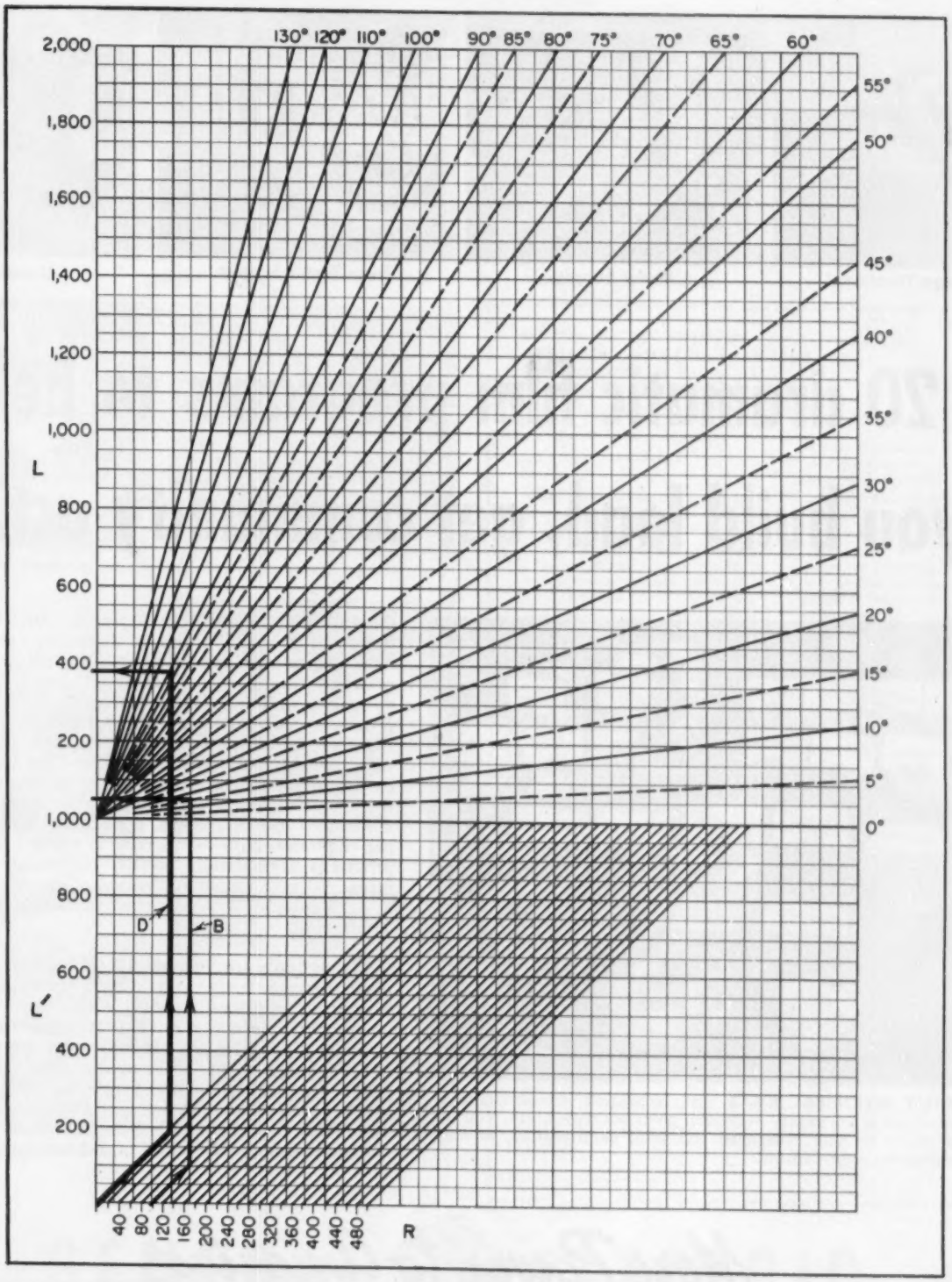
Bullard's formula was published in the 1948 A.I.E.E. Transactions, in Technical Paper 48-72 by Bullard, Pette and Rhodes. This formula was developed for radius bends about 200 ft and more. Experience has indicated this formula is acceptable but conservative for bends of shorter radius.

Nomograph for operation of Eq. 2

$$L = (e^{Ka} - 1)(L' + R/K)$$
where K = 0.7

→

Calculated By Simplified Method



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Outdoor Recreation

Barn Hay Curing

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20 dramatic film programs to help you build load, get community action

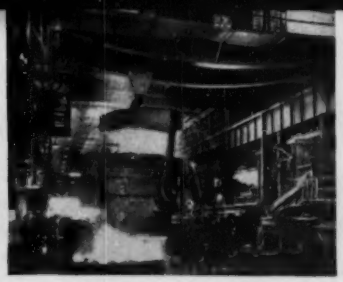
LATEST ELECTRICAL IDEAS and techniques are dramatically portrayed in the twenty MPA film programs shown here. You can use them to build industrial and farm electrification, promote community improvement.

General Electric's "More Power to America" film library is a special series of programs designed to help you increase industrial and farm electrification, promote community improvement, and to stimulate your own public-relations activities. Each of these programs contains an educational motion picture or slidefilm, an authoritative manual, and supplementary literature. Specifically designed for use by the electric utilities, these packaged programs represent the best co-operative thinking of electrical and machinery manufacturers, application and consulting engineers. Non-commercial in nature, these film programs dramatically portray the latest electrical ideas and techniques in the use of electrical power in fields ranging from Materials Handling to Sewage Treatment.

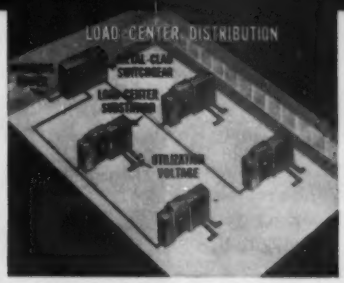
The nation's leading utilities and other organizations are now using over 2000 "More Power to America" programs as vital components of their power sales and community development activities. Utilities of all sizes are placing increasing emphasis on MPA's creative, mass-selling methods. If you would like full details and prices of these film programs—or if you would first like a preview—contact your local G-E Apparatus Sales Office, or mail the coupon to General Electric Co., Schenectady 5, N. Y.

More Power to America

Resistance Welding



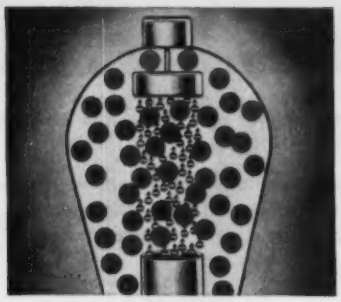
Materials Handling



Industrial Power Distribution

Laundry Electrification

Textiles

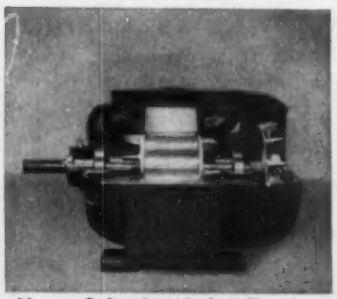


Electronic Training Course

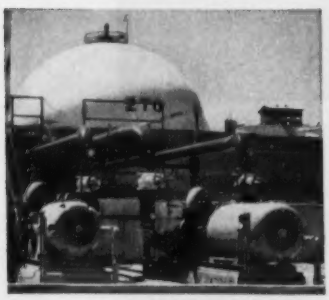
Electric Arc Welding

SEND IN COUPON BELOW

Progressive Mechanization

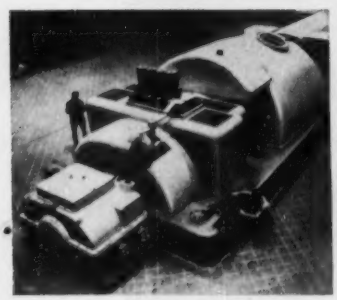


Motor Selection & Application

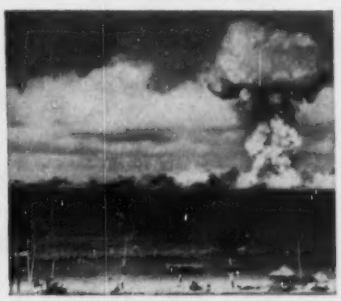


Oil Field Electrification

Industrial Heating



Freedom and Power



Atomic Power

GENERAL ELECTRIC COMPANY
APPARATUS SALES DIV., SEC. H 684-3
SCHENECTADY 5, N. Y.

I am interested in the following film programs:

✓ **for details and prices**
✕ **on a loan basis**

- ☐ Sewage Treatment (25-minute, 16-mm sound-color motion picture) (GEA-4938-5A)
- ☐ Outdoor Recreation (20-minute, 16-mm, sound, black-and-white motion picture) (GEA-4938-15)
- ☐ Water Supply (25-minute, 16-mm, sound-color motion picture) (GEA-4938-17)
- ☐ Urban Transit (17-minute, 16-mm, sound-color motion picture) (GEA-4938-20)
- ☐ Barn Hay Curing (28-minute, 16-mm, sound-color motion picture) (GEA-5074-1A)
- ☐ Farm Water Supply (20-minute, 16-mm, sound-color motion picture) (GEA-5074-3)
- ☐ Electrified Farming (20-minute, 16-mm, sound-color motion picture) (GEA-5074-5)
- ☐ Laundry Electrification (30-minute, 35-mm, black-and-white sound slidefilm) GEA-4938-1A)
- ☐ Electronics Training Course (Twelve 20–30-minute, 35-mm, black-and-white sound slidefilm) (GEA-4938-3B)
- ☐ Resistance Welding (30-minute, 16-mm, sound-color motion picture) (GEA-4938-6A)
- ☐ Power Distribution (20-minute, 35-mm,sound-color slidefilm) (GEA-4938-8B)
- ☐ Oil Field Electrification (30-minute, 16-mm, sound-color motion picture (GEA-4938-9A)
- ☐ Materials Handling (24-minute, 16-mm, black-and-white sound motion picture) (GEA-4938-10A)
- ☐ Electric Arc Welding (27-minute, 16-mm, sound-color motion picture) (GEA-4938-11)
- ☐ Textiles (26-minute, 16-mm, sound-color motion picture) (GEA-4938-13)
- ☐ Industrial Heating (30-minute, 35-mm, black-and-white sound slidefilm) (GEA-4938-14)
- ☐ Motor Selection and Application (Ten 10–30-minute, 35-mm, black-and-white sound slidefilm) (GEA-4938-16A)
- ☐ Progressive Mechanization (27-minute, 16-mm, sound-color motion picture) (GEA-4938-18)
- ☐ Freedom and Power (29-minute, 16-mm, sound-color motion picture) (GEA-4938-19)
- ☐ Atomic Power (15-minute, 16-mm, sound-color motion picture) (GEA-4938-22)

NAME .....

TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

GENERAL ELECTRIC

Reel Hauler

(*Continued from page* 148)

one length of cable has to be replaced with another, this truck can transport a full and empty reel to the job, can do the removal and installation, and return the pulled out cable and empty reel to the warehouse.

Moreover, the unit has roadability that makes it very effective for work in outlying areas. With a small crew, it can do an amount of work comparable to that of a larger crew equipped with a pulling tractor and semi-trailer, but less than a similar crew with the first mechanized cable reel handler and tractor semi-trailer.

SELF-CONTAINED UNIT consists of an industrial-type station for transporting the crew, a small two-wheel equipment trailer, and a combination cable pulling truck and reel handler

Some mechanical difficulties were encountered when this equipment was first put into service. However, these troubles have been eliminated, and the operation is now considered very satisfactory.

ACSR Strand Breaks Repaired with Links, Clamps, and Rods

W. A. SCHULZ, Supt. of General Engineering, Public Service Co of Indiana, Plainfield, Ind.

An insulator extension link, a new aluminum clamp, and preformed armor rods have been used to repair conductors of a Public Service Co of Indiana transmission line. Repairs were started after an inspection revealed strand breaks in the 397,500-cir-mil ACSR (30 x 7) conductors, which were installed in 1926-27 without vibration dampers and armor rods.

To avoid splicing in new conductor at deadends, a flat galvanized steel extension link, having a tensile strength of 25,000 lb, was installed between the tower and the insulator string. Length of the links varied with conditions at each structure, so that the insulator strings extended out beyond the strand breaks.

A new envelope type of aluminum clamp was developed for use at deadends. It has an integral attachment lug cast into the clamp to which the female end of a standard compression jumper terminal can be bolted.

Vibration breaks in conductor strands at suspension clamps were repaired with preformed armor rods to provide a mechanical and electrical bridge around the breaks. New suspension clamps were installed because old clamps would not fit over rods.

Throughout the job the conductor was kept in tension. This saved as much as $20 to $30 per insulator string at some locations.

(*More How To on page* 160)

EXTENSION LINKS were installed between tower and insulator string during conductor repairs at deadends. This avoided splicing conductors. Newly designed clamp was also installed

PREFORMED ARMOR RODS were installed at suspension clamps to provide mechanical and electrical bridges across the strand breaks during the conductor repair operation

LET'S LOOK AT THE "MK-40"—*your best buy*

AND THE STANDARD OF COMPARISON!

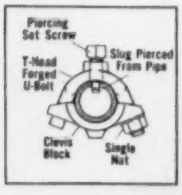
Universal acceptance by operating engineers is abundant proof of the sound engineering principle incorporated in the design which provides ample material for heat dissipation and assures high thermal conductivity.

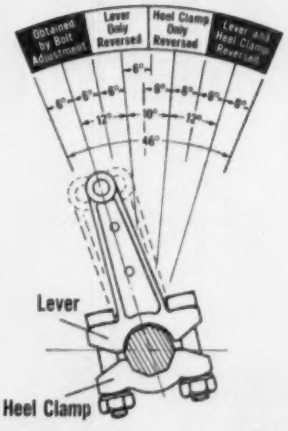
Its simplified construction and improved high pressure contacts at both ends of the blade maintain the highest mechanical and electrical performance under the most severe weather and service conditions.

You can select a Delta-Star group-operated "MK-40" switch for every type of service, from 7.5 through 230-kv and current ratings to 5000 amperes.

OPERATING MECHANISM

Switch and control bearings have greaseless, non-rusting ball bearings insuring free operation under all weather conditions. Self-piercing set screws on clamp type U-bolt fittings eliminate threading or drilling of pipe. Completely adjustable lever can be installed or removed without disturbing rotating insulator.



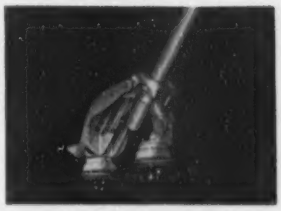


CURRENT PATH

From terminal to terminal the number of current interchange surfaces are reduced to an absolute minimum. Both ends of the floating tubular blade have the same type of high pressure contact backed by independent pressure applying members. No other moving contact surfaces or springs; everything in plain view for visual inspection.

BLADE MECHANISM

Fully controlled blade is actuated by a 45-degree bearing mechanism replacing cranks, levers, links and cams. It converts motion of operating insulator to a vertical lifting and rotating motion of the blade with just the right mechanical advantage. Blade locks automatically in both opened and closed positions.



CONTACTS

Current carrying function of the contacts is independent of the pressure applying members to permit the use of materials with the best electrical and mechanical characteristics for each function. Hand drawn copper shoes have heavy silver inlays. Long, beryllium copper springs maintain uniform contact pressure and carry no current.

When you want the best in high voltage switching equipment—specify DELTA-STAR

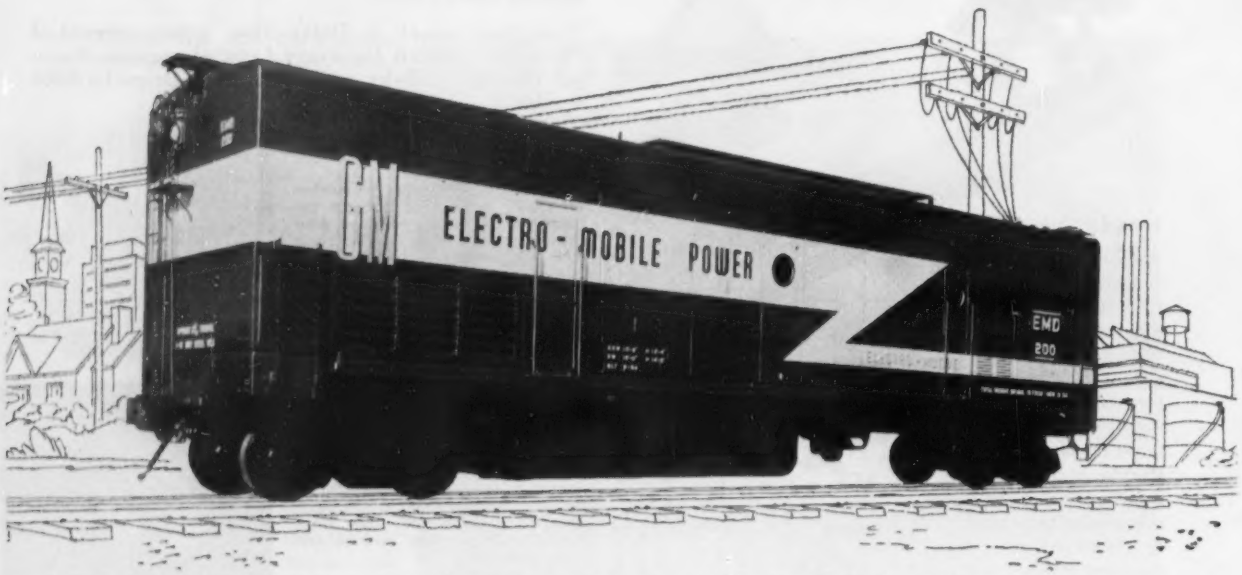
DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities

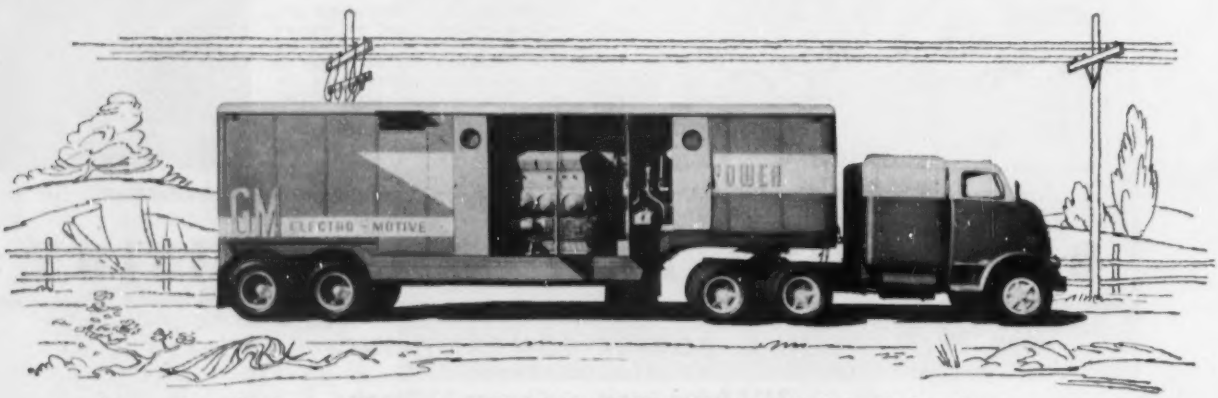
Now - from a single maker of all major components –

ELECTRO-MOBILE POWER

for electric utility use in fringe area interim boosting – at unprecedented low cost



For Rail Movement. Rail car with 1,000 or 750 kw. capacity. May be used on sidings, or placed on piers for semi-permanent use.



For Highway Movement. Truck trailer with 500 or 350 kw. capacity for transfer by roadway.

FOR THE FIRST TIME, electric utility companies are offered mobile generating units with the double advantage of a single manufacturing responsibility and mass-production economies.

Electro-Motive Division of General Motors designs and builds major components, such as engines, alternators, control apparatus and vehicles for three versatile new types of supplementary power. These are combined into units perfectly coordinated for maximum performance and dependability, for which one manufacturer assumes full responsibility.

Because most of these major components already are in manufacture for use in General Motors Diesel locomotives, Electro-Motive's existing tooling and long organized production facilities are price-lowering factors that permit a point-of-application cost hitherto untouched in this type of equipment.

Here, from America's most experienced builder of Diesel-Electric generating equipment, is a new and economical means with which electric utilities may meet their power supply problems in the fringe areas and handle emergencies in other districts.

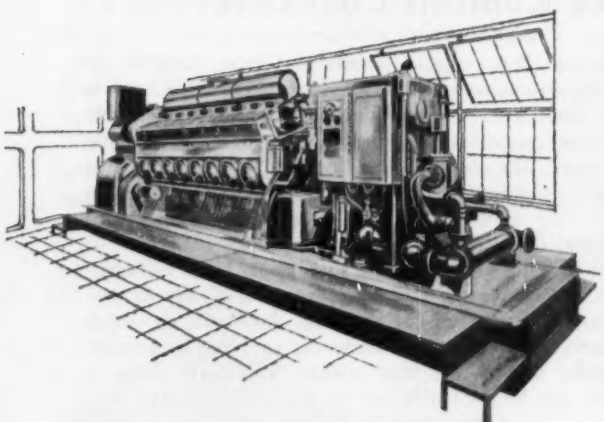
We will be glad to discuss your specific needs.

Electro-Motive Division

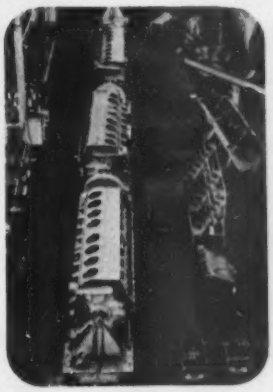
GENERAL MOTORS

La Grange, Illinois

Electro-Motive Division offices located in: New York City, Chicago, Jacksonville, St. Louis and San Francisco.



For Semi-Permanent Installations.
Portable unit of 1,000, 750, 500 or 350 kw. capacity.



Electro-Mobile Power has the famous fast-starting, two-cycle engines used in General Motors Diesel-Electric locomotives. These locomotives today equal in capacity one-sixth of all the country's installed electrical generating capacity.

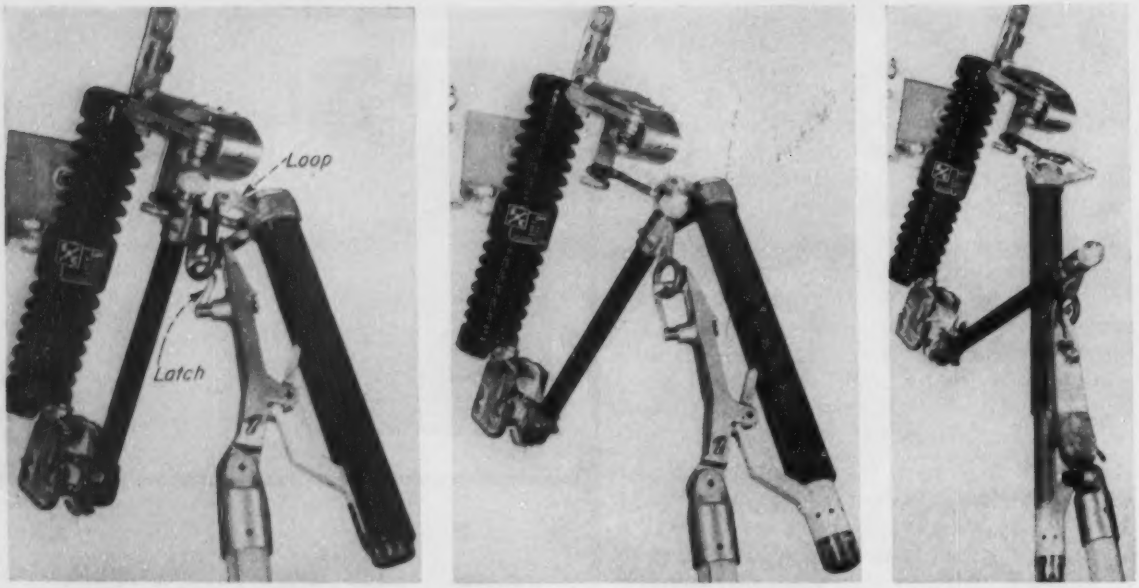
The Manufacturer's Nationwide Organization sells and services all components of these units. Nine regional factory branches and/or parts warehouses assure prompt and complete service facilities.

ELECTRO-MOBILE POWER

FEATURES INCLUDE:

- Remote control starting and stopping
- From starting to full load within 45 seconds
- Automatic synchronization with line in frequency, voltage and phase
- Inherent 25% overload capacity
- Full protective equipment, including 3-phase surge capacitors, lightning arresters, over-current relays, field failure relay
- Automatic operation can be provided
- Ability to meet higher capacity needs by multiplying units
- Complete national parts and service availability

All units may be used in multiple to meet any desired capacity



OPERATING SEQUENCE shows: (left) tool being engaged to the special cutout, (middle) opening motion begun but before the interrupter tripped, and (right) disengaging the tool from the cutout after the interrupter has tripped. Note action of latch during operations

Interrupter for Breaking Load with Cutouts is being Developed

JOHN R. CONRAD, President, S&C Electric Co, Chicago, Ill.

Equipment for load switching with open-type distribution cutouts is being developed by S&C Electric Co. It consists of an interrupting tool for opening a specially designed cutout with the aid of a universal hot-line stick.

Heart of the scheme is the portable, easily manipulated tool, which has repetitive action. The tool comprises an interrupting unit with an externally mounted loop and hook for engaging the cutout at two points. The special cutout has accommodations at the upper contact and at the fuse tube to which the tool is attached during opening.

In operation, the tool is attached to a universal hot stick and then engaged to the cutout. As the pull ring is engaged, a spring-loaded latch locks the ring to the tool.

Pulling the stick opens the cutout, and current is shunted through the interrupting unit. Continued pulling trips the interrupter and opens the circuit within the vented interrupter.

To disengage the tool from the cutout, the hot stick and, therefore, the tool is turned either clockwise or counter clockwise. This opens the latch holding the pull ring and rotates the loop on the interrupter cap off of the cutout.

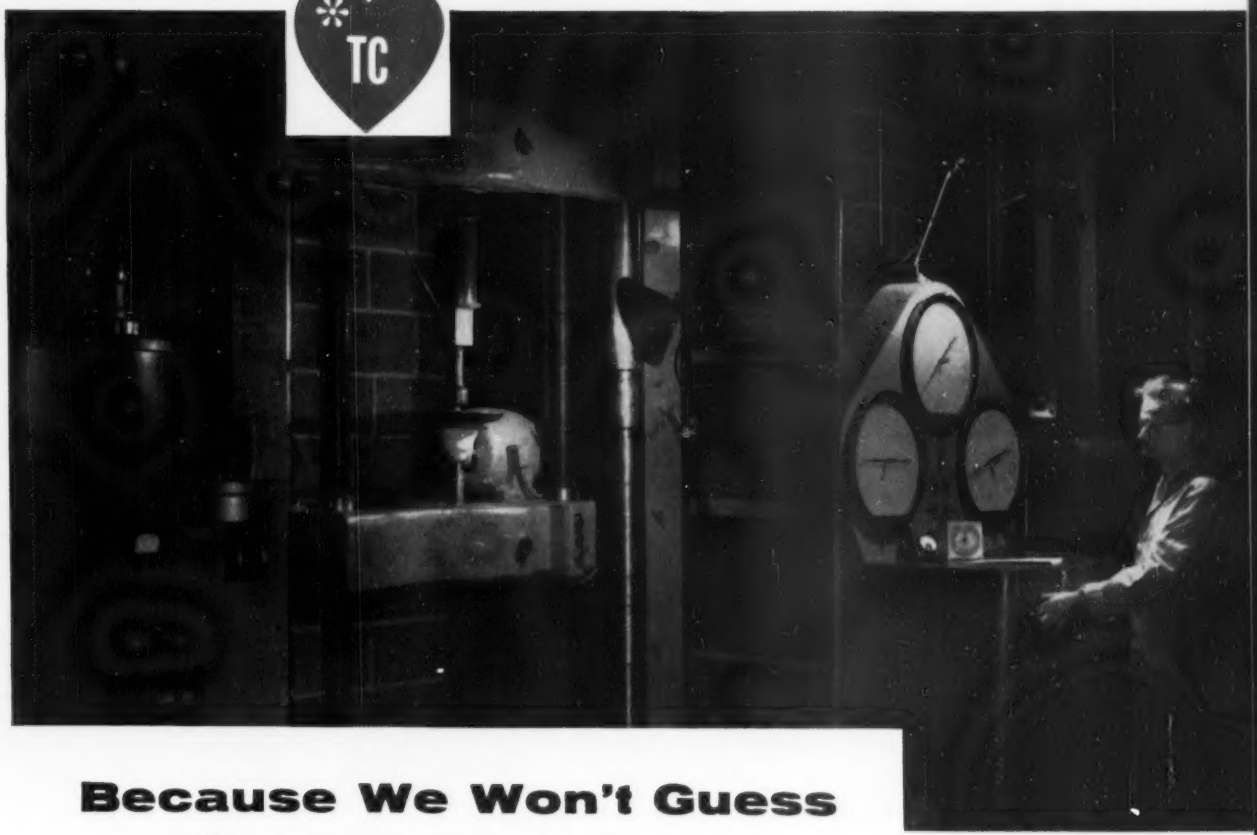
Capacitance-Type Electronic Device Controls Coal Level

A capacitance-type electronic coal level alarm is operating satisfactorily at the Deepwater plant of the Atlantic City Electric Co. It functions with any slight change in electrical capacitance at a probing electrode in the hopper bin wall. The electrode, bent at right angles to the bin wall, is durable plastic. This material resists abrasion. An angle iron shield protects the electrode from direct impact with the coal.

At the Deepwater plant the coal hopper is fed automatically. Whenever the coal level drops sufficiently to partially uncover the sensing electrode, the electronic circuit actuates an alarm. This alerts the operator to possible difficulty in the coal feed system. This level alarm is stable, can be used with wet or dry coal, and fails safe.

(*More How To on page* 165)

SMALL SIZE and simplicity permits easy installation of coal level electronic control unit and probe sensing electrode



Because We Won't Guess You Don't Have To!

Every month we fill a standing order from the Laboratory for 3,000 perfectly good suspension insulators -- enough to build about 20 miles of 69-kv line -- and all they do is smash 'em up daily on combined M & E test! This isn't a special case. It has happened for years and will go on indefinitely.

The purpose of this seemingly wasteful procedure is to put a truly significant number of points on a control curve of normal distribution. From such a curve precise analysis can be made of our total production. Consistent strength of O-B suspension insulators becomes a mathematical certainty.

Our contributions to statistical production control have placed us at the forefront in this modern technique. Details can be studied in such sources as Paper 45-89 in the 1945 Transactions of AIEE, in the Bulletin of EEI for December 1948, or the published papers presented before the International High-Tension Conference (CIGRE), held in Paris in 1950.

In supplying suspension insulators to the electrical industry it is one thing to develop designs that appear to have proper strength characteristics. But it is far more important to be sure these characteristics are present in *every* unit. We have applied an uncommonly high degree of Technical Competence in removing the guess-work from suspension insulators. And because *we won't guess, you don't have to!*

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

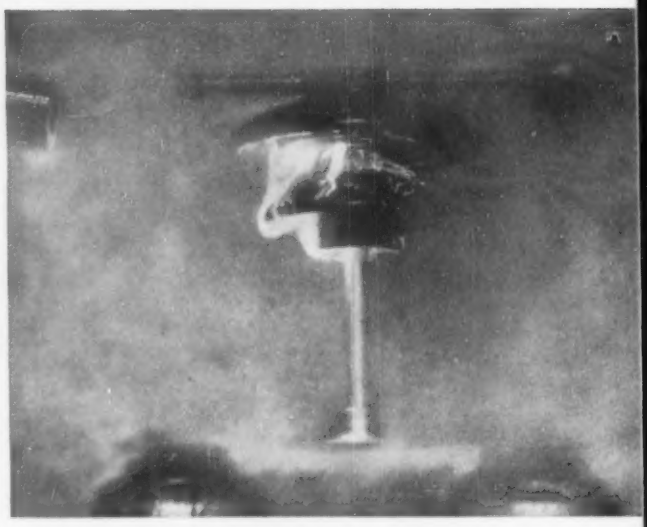
TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

Fitting A Product To A Problem

Is this an ordinary flashover -- look again! There is no discharge to the conductor or over the top insulator surface. This is a test set-up combining severe contamination and dense fog. Here it is possible to study the action of insulators under conditions of abnormal electrical leakage sometimes encountered in coastal areas, desert regions, or industrial districts. But does our ability to see it help the problem any?

It works two ways. First, we can evaluate basic insulator shapes. We can gauge their ability to resist, or at least retard, the accumulation of conductive air-borne deposits leading to surface leakage. We can approach this question equipped with *facts*.

Second, we can offer useful advice to power companies faced with a contamination problem. It is possible to provide engineers with workable data regarding: amount of insulation, the leakage probability of a given deposit, organization of cleaning procedures, cleaning methods, safety of present insulation in the light of a proposed voltage increase, and many other details concerning the rather complicated subject of contamination.



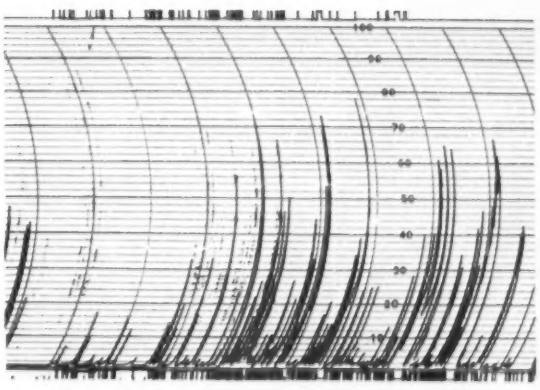
When you study the published standards under which insulators are made you will find no reference to a manufacturer's ability to fit the product to a problem. The big difference between buying mere insulators, and buying *insulation*, is Technical Competence, the heart of every O-B insulator!

How Contamination Produces This Type Of Leakage

Certain types of contamination on an insulator when mildly wetted as with fog, permit the flow of significant amounts of leakage current. The contaminated coating is never perfectly uniform, due to the relation of insulator shape and prevailing wind direction. Leakage currents flowing through the lesser conducting regions tend to dry out such areas. The high voltage which results may be sufficient to create a low current arc which bridges the dried-out zone. Thermal air currents, caused by the heat of the arc path, tend to increase the arc length. The ends of this arc run along the insulator surface, thus bridging out more and more of the conducting coating, thereby reducing the resistance remaining in series with the arc. The increasing arc current is able to sustain this longer arc path. If the length of the arc path increases at a greater rate than the supporting current, the arc is extinguished. The birth, growth, and extinction of this arc causes a leakage current surge which may be observed with suitable equipment, such as shown in the accompanying photograph.

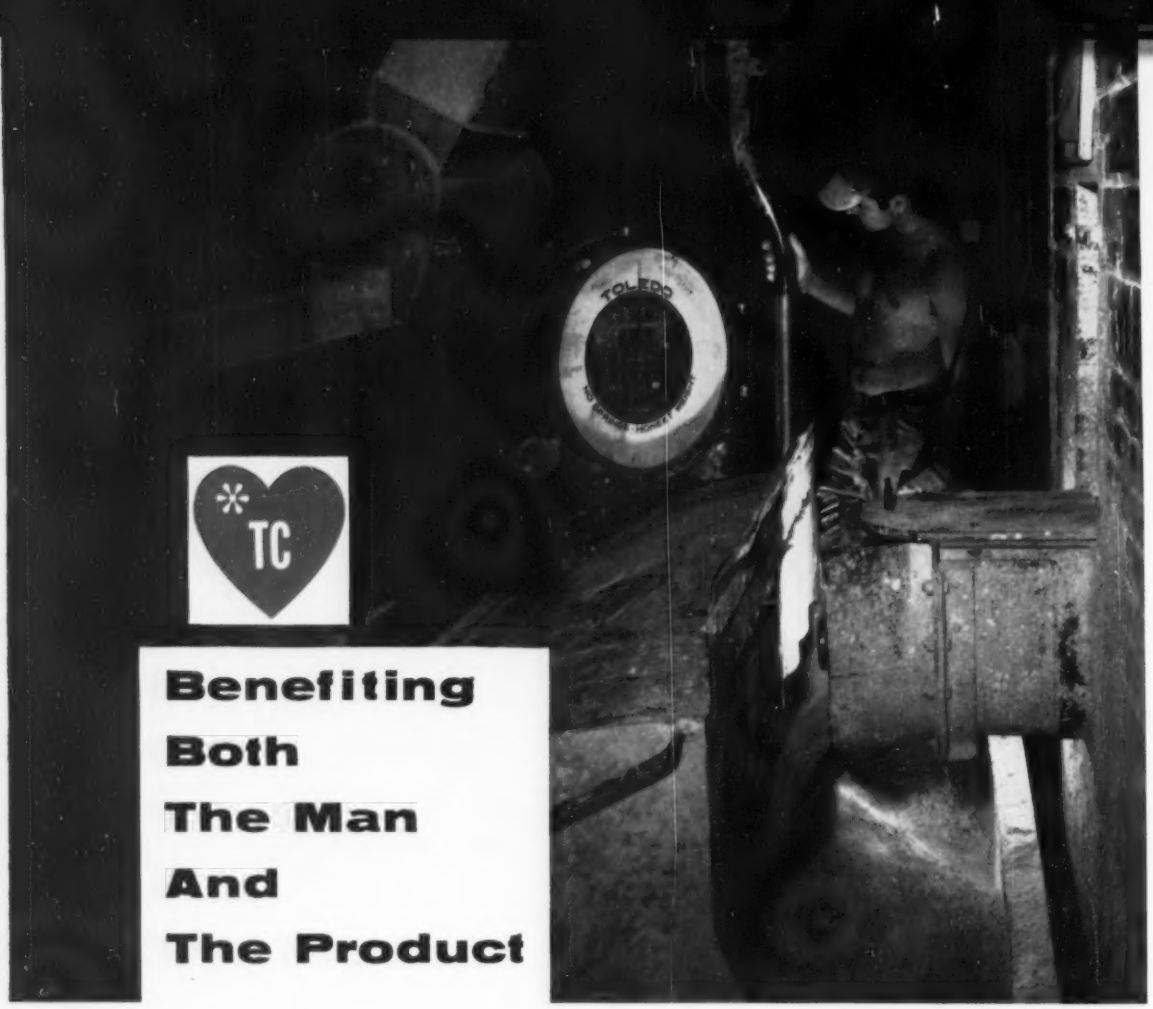
When the surface is sufficiently conducting, these leakage current surges may reach or exceed a critical value of 50 milliamperes, in which case the insulator is in imminent danger of flashover. In the accompanying photograph, leakage over the top shell is supplying the surface arc on the lower petticoats. However, the conductivity of the coating on this top shell has not quite reached the stage of supplying sufficient arc current to sustain an arc path length necessary to effect complete flashover. From the recording milliammeter chart, it will be seen that this critical value of 50 milliamperes was reached and exceeded several times during the 4½ minute test.

When a contaminated insulator is put through its paces in the fog box, quite an array of laboratory equipment controls and reads its behavior. At the left is the variable voltage transformer and input voltage meter controling the 60-kv test transformer. Progressing toward the right is a three-level counter which records the number of electrical surges occurring at selected milliampere values. This works in conjunction with the next instrument, an automatic range changer for the strip chart recording milliamperes. Next is the recording milliammeter whose chart is reproduced and discussed. The small dial instrument is a variable shunt which provides a leakage current potential for use in the cathode ray oscillograph. The technician is adjusting an electronic switch which permits simultaneous readings of leakage current and applied insulator voltage on the last instrument, a cathode ray oscillograph. For purposes of a better photograph, the sheet of glass ordinarily covering the face of the fog box has been removed. With the glass in place, any degree of fog concentration can be produced, often practically obscuring the test specimen.



Milliammeter record of an actual test. This chart travels at a speed of one main division each 30 seconds. Vertical divisions read from zero to 100 milliamperes. Surges in excess of 50 milliamperes indicate the likelihood of insulator flashover at line voltage. Small vertical lines at the top and bottom of the chart indicate the functioning of the automatic range changer which protects the recording milliammeter on the higher surges, yet permitr greater sensitivity for low currents.

the heart of every Ohio Brass insulator



Benefiting Both The Man And The Product

It once seemed impossible to make the "batching" of raw clay anything but an inaccurate, dirty, dangerous job. Several clays go into a porcelain mix. When handled by hand, human errors were always present -- aggravated by almost intolerable dust that was also a health hazard.

Now, the batching gallery is one of the cleanest places in the O-B factory and one of the best-controlled operations. Various clays are stored in a long row of massive concrete bins. According to prearranged instructions the batch car is moved to certain chutes leading from the bases of these storage bins. By accurate weight, a measured quantity of clay is collected at each point. The car cannot be moved from stop to stop until the operator makes a record on an automatic printing scale. The completed card shows just what clays and how much of each went into every batch, and the card is retained by the inspector.

A powerful vacuum system draws off dust before it can enter the air. The department is now a clean, orderly, healthful place to work -- a place where a man can do his job well.

Nobody will ever remove all the tradition from the potter's trade, but bad tradition must give way to modern production methods, and a modern attitude toward human welfare. Better working conditions benefit both the man and the product.

After all, there's a practical side to Technical Competence, the heart of every O-B insulator.

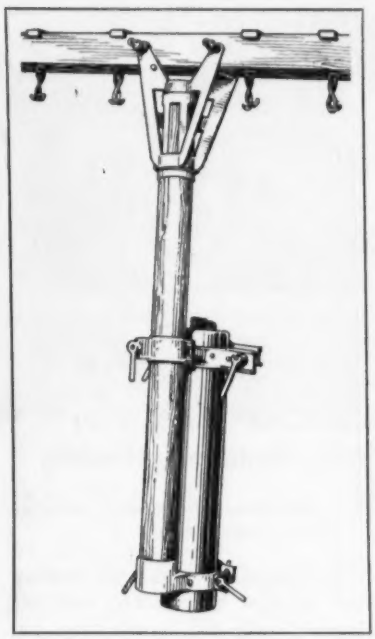
OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Lt'd., Niagara Falls, Ont.

TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

4416-H

Milk of Magnesia Keeps Bolts Turnable

Milk of magnesia is being prescribed by General Electric Co for keeping nuts and bolts turnable. Research engineers found that application of the remedy prevents nut and bolt threads from melting together and locking even after three weeks at 900C.



ENERGIZED LINES under 5 kv may be carried on a transfer arm mounted on a gin pole

Raise Conductors on Temporary Crossarm

HARRY KIEMELE, East Bay Division, Pacific Gas & Electric Co., Oakland, Calif.

Pole-top reconstruction on energized lines below 5 kv is facilitated by the use of a temporary transfer crossarm devised by the author. The device is designed so that it may be passed through energized lines with ease and safety.

The transfer unit consists of a standard crossarm mounted on the tee top of a standard transformer gin pole. The arm is free to rotate on the gin so that it may be aligned parallel to the energized conductors when the device is raised to the top of the pole. The gin is clamped to the pole and the arm placed in the proper position.

To meet variable field conditions, the crossarm may be fitted with pin insulators or hooks or both. PG&E

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Blueprints FOR PROGRESS

one dependable source ... for specialized electrical equipment

An organization streamlined for maximum efficiency ... a combination of specialized and diversified talent, experience and facilities essential for the development and production of electrical components and assemblies which meet the fast-changing requirements of industry.

Leach comprehensive experience in research, engineering, manufacturing and service, on electrical, electronic and electromechanical equipment, have constantly been and are still being expanded for more efficient operation, stepping up production, thereby lowering costs to customers.

Put this specialized and technical experience to work on your specific requirements, to assure the full performance originally built into all products.

For aircraft, commercial and industrial efficiency and safety ... *Leach* has become *The Most Trusted Name in Specialized Electrical Equipment*

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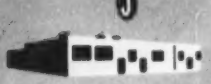

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REVOLUTIONARY NEW IDEA IN SPLICING...

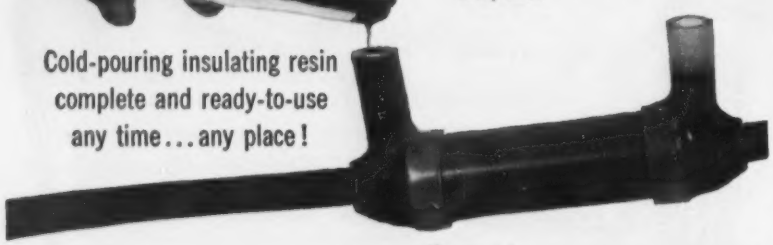
"SCOTCHCAST"!

Now you can turn out completely insulated, sealed cable splices *in minutes* with "Scotchcast" Electrical Embedment Resin No. 4 in new ready-to-use "Unipak".

"Unipak" is a new single-package envelope containing famous "Scotchcast" Resin and hardener. To prepare the "Scotchcast" for use, you simply squeeze the package to mix—then, pour the activated resin and hardener into the splice mold. And, once poured, "Scotchcast" Insulating Resin quickly cures into a tough, protective casing without the application of heat. It resists acids, alkalies, solvents, and oils—has excellent adhesion to most metals, plastics, and conductors.

The "Scotchcast" Splicing Kit contains everything you need for a perfect splice every time!

Cold-pouring insulating resin complete and ready-to-use any time... any place!



We'll be glad to send you complete information on this revolutionary new idea in splicing—just clip and mail the coupon.

From this to this in minutes with

SCOTCHCAST BRAND Electrical Embedment Resin

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MINNESOTA MINING AND MFG. CO.
St. Paul 6, Minn.

Please send me complete information on the new "Scotchcast" Splicing Kit. I understand there is no cost or obligation.

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The term "Scotchcast" is a registered trademark of Minnesota Mining and Manufacturing Company, St. Paul 6, Minn. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ontario Canada.

3M COMPANY

prefers the hooks because conductors may be hung underneath the crossarm instead of having to be lifted above it and placed on the insulators.

WHEN LOADING REELS trailer is tilted with reach up so that arms of the U-shaped pipe can be slipped over the pipe on trailer

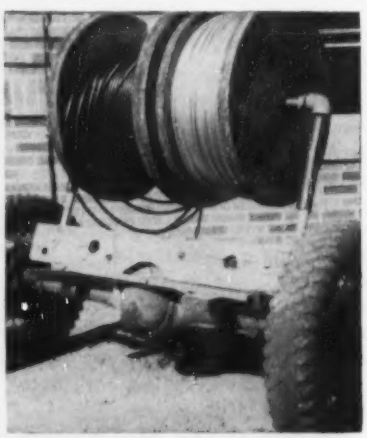
Low-Cost Trailer Aids Wire Handling; Hauling

M. L. MONSON, Superintendent, Municipal Utilities, Fosstown, Minn.

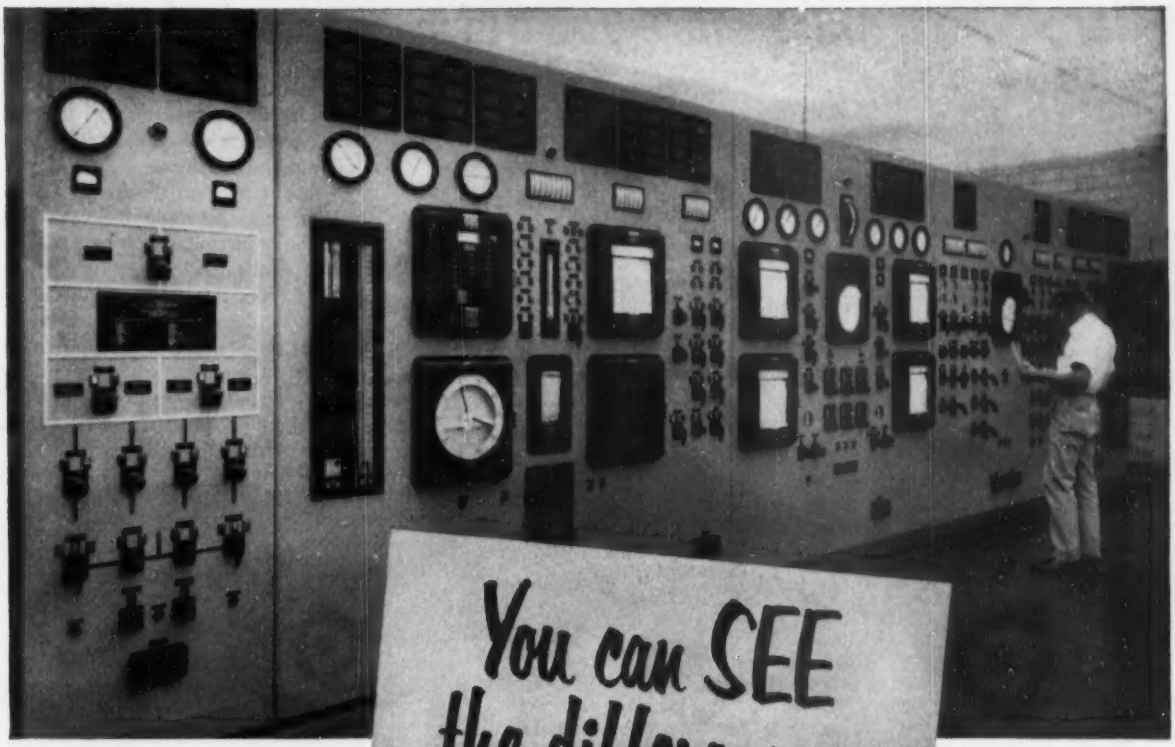
An inexpensive trailer for hauling reels of wire has reduced work in stringing wire and saved time for Fosston Municipal Utilities.

Reels fit onto a U-shaped pipe. They are put on the pipe by unscrewing one section of the pipe from the elbow, at one corner. Arms of the U are of 1½-in. pipe.

There are two upright pieces of



READY TO ROLL, trailer with reels in place is pulled to the job and is ready for wire stringing operations when it arrives



You can SEE the difference...

L+N complete panels serve the needs of your operating personnel. Each panel is designed and custom-built to your requirements. Instruments and controls are arranged in a functional pattern for easy reading . . . assist in reducing fuel costs and operating errors.

L+N complete panels save time and costs for your panel installation. We completely assemble each panel in our plant, with all instruments in place, double-checked and tested. You receive panels ready to go when connected to primary elements and control devices.

L+N complete panels solve your panel engineering and design problems. Our panel engineers convert your requirements for control of boiler, turbine and auxiliary equipment into a functional layout for your approval. From this layout we prepare the electrical and piping diagrams and the final steelwork drawings. You receive prints of these drawings as part of our standard panel engineering service.

***Let an L&N panel engineer** study your problems; he'll explain in detail what we can do for your particular plant. Our fifteen years in building panels for many utilities assures you of* effective service. *Write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.*

LEEDS NORTHRUP
instruments automatic controls • furnaces

Here's how much more you get when you buy—
ONAN Electric Plants

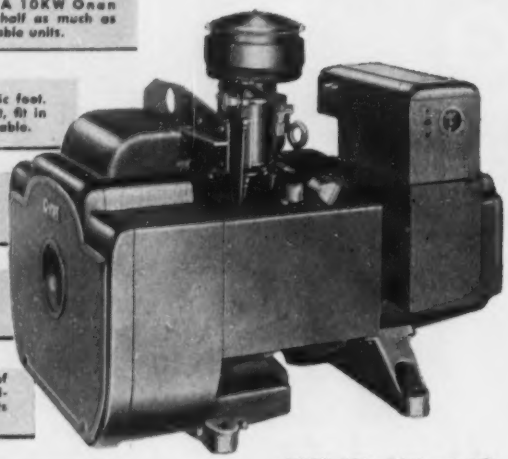
HIGHER CAPACITY per pound of weight. A 10KW Onan weighs only half as much as other comparable units.

MORE OUTPUT per cubic foot. Onan units are compact, fit in small space, easily movable.

UNIT-BUILT CONSTRUCTION Onan-built plants are direct-connected for permanent alignment, long life.

SPECIAL ELECTRIC PLANT ENGINES. Onan-built engines have massive bearings and other parts to assure durability.

VERSATILITY. A wide variety of accessories such as skids, dollies, trailers, adapt Onan units to more jobs.



MODEL 5CW—5,000 watts A.C. two-cylinder, air-cooled, gasoline powered.

48-HOUR SERVICE. Repair parts and factory experts are close to any part of the U.S. Many foreign parts depots.

. . . yet kilowatt for kilowatt, an ONAN costs you less than any other electric plant!

ONAN gives you many advances in electric plant design, plus proved dependability on the job! You pay no premium for these Onan features . . . in fact all the electric plants shown here are priced lower than other plants of similar capacity.

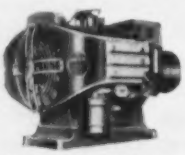
The Onan line is complete, with scores of different sizes and a great variety of optional equipment, making it easy to pick just the right electric plant for particular jobs *with savings in weight, space and operating expense.*

For any job requiring an independent source of electric power, Onan gives you greater all-around service and unequalled value too . . . measured either by first cost or in the long run.

. . . *Gasoline or Diesel-powered Air or water-cooled*

GASOLINE: Air-cooled—400 to 10,000 watts. Water-cooled—10,000 to 50,000 watts.
DIESEL: Air-cooled—3,000 and 5,000 watts. Water-cooled—15,000 to 55,000 watts.

MODEL 305CK—3½KW A.C. 2-cyl. air-cooled, gasoline engine.



MODEL 5DRP—5KW A.C. Diesel two-cylinder air-cooled.

MODEL 3DSP—3KW A.C. Diesel one-cylinder air-cooled.

Write for specifications and descriptive folder!

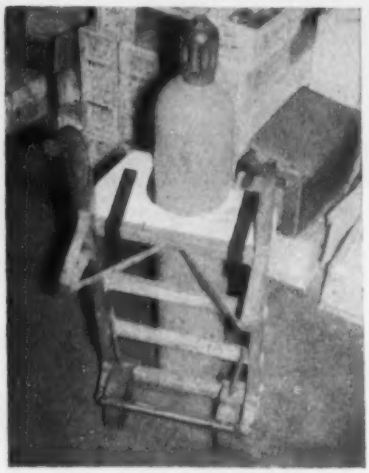
D. W. ONAN & SONS INC.
8251 University Avenue S. E., Minneapolis 14, Minnesota

1-in. pipe on the trailer. To load the reels the trailer is tipped up so that the upright 1-in. pipes swing into a horizontal position and the 1½-in. pipe, forming the arms of the U carrying the reels, is slipped over the 1-in. pipe on the trailer.

With one man on the trailer reach and one man handling the reels of wire, the trailer is then righted and hitched to the truck.

On the job, it is simple to pay out wire from the reels on the trailer. There is no unnecessary handling of wire reels or coils.

The trailer is also used for hauling poles. Upright pipes help to keep poles in place.



Cradle Carries Gas Cylinders Safely

M. J. MOREE, Ohio Power Co, Portsmouth, Ohio

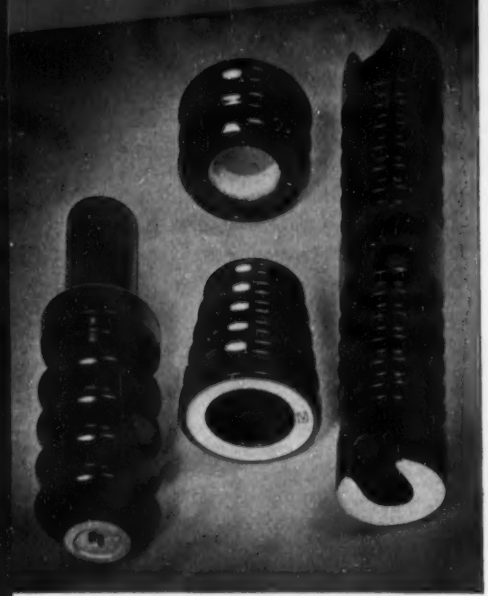
A wooden cradle that can be readily attached to a hand truck cuts time and effort in safely handling 220-cu-ft gas cylinders in Ohio Power Co's store rooms. Lateral movement or rolling of the cylinder is prevented by the cradle, and loading of gas bottles is more easily accomplished than when chains are used as a fastener. In addition, when the truck is used for other purposes, accidents caused by a loose, dangling chain are eliminated.

The cradle was made from salvaged lumber; and outdoor-meter-box hangers, costing 23¢ each, were used for holding clamps. Cost of the cradle approximates the cost of snap chains, for the same purpose.

Continuous laboratory testing and special treatment of water make possible Victor *Purified* Porcelain

Another Reason Why—

VICTOR Makes Better Insulators



Victor manufactures many special shapes in addition to a complete line of standard porcelain for transmission and distribution.

ONLY VICTOR MAKES

PURIFIED PORCELAIN

Many milestones in insulator progress have been due to VICTOR research. But none is as important as its development of *Purified* Porcelain. By specially treating the water used in the manufacture of VICTOR Insulators and employing many other ceramic advances, VICTOR gives you the finest insulator porcelain ever made—porcelain which, for the first time in the industry, is *pure* porcelain all the way through!

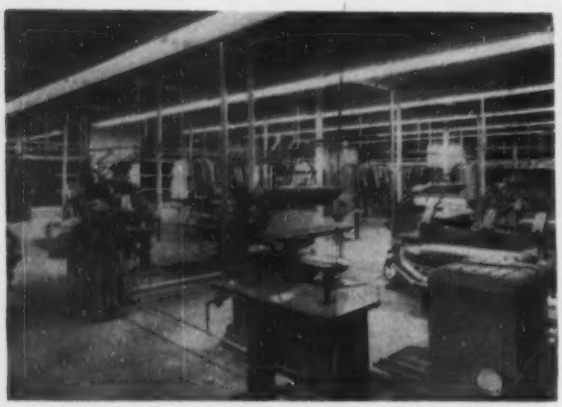
Purified Porcelain has vastly greater uniformity in mechanical and electrical strength values, higher mechanical impact and puncture voltage values, greater density, hardness and permanence than any other insulator porcelain. That's why more and more power men are specifying VICTOR *Purified* Porcelain Insulators.

Specify

VICTOR *PURIFIED* PORCELAIN INSULATORS

VICTOR INSULATORS, INC., VICTOR, N. Y.
SUBSIDIARY OF I-T-E CIRCUIT BREAKER CO.

Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators
Custom Designed Porcelain



IMPROVED LIGHTING and air circulation in finishing room reduced labor costs 2%, improved quality of work, reduced fatigue of employees and practically eliminated employee turnover

LIGHTING and other remodeling boosted business 3½ times at Falconer Cleaners and Launderers. Management believes that the good lighting throughout the plant has paid for itself in many ways

Lighting Boosts Laundry Business

C. J. AAS, Sales Engineer, Northern States Power Company, Minneapolis, Minnesota

Greatly increased business, lower labor costs and improved employee morale resulted when Falconers Cleaners & Launderers improved lighting and air control in its Minneapolis plant. Employee turnover virtually stopped, the quality of the laundry's work went up, and customers left more-satisfied.

Arnold Vartdal, vice president and treasurer, said:

"Since this latest remodeling, our cash and carry business has increased almost 3½ times. Since 1945 our business has increased nine times. We feel that the excellent lighting and new system of air control in the Finishing Department have improved working conditions 100%. All of our employees in that department have remarked on the decrease in fatigue at the end of the day. 'We just don't feel tired now', they say. They are much more willing to put in extra hours when needed. Our employee turnover in this department is down to nothing and our overall labor cost is down 2%, all due, we believe, to the improved environment.

"The lighting has contributed greatly to better working conditions, better quality of work, improved employee morale, and better satisfied customers. We feel that the good lighting throughout the plant has paid for itself in many ways."

The present owners took over the business in 1945. At that time only laundry service was offered to their customers, and business was at a standstill. In 1946 the garage was remodeled and dry cleaning service added. Another addition was built in 1950. In 1951 drive-in cleaning service was started as an experiment aimed at improving service to customers.

Last year another new addition was built and improvements made in the drive-in facilities. At that time a Poster Panel Sign was installed to advertise the current special, which is changed every two weeks.

The new addition made possible the following changes: Additional space was added to the sales area; new laundry and drive-in cleaning storage racks were installed; another part now contains the dry cleaning plant; the balance of the new area is now used by the Finishing Department.

The finishing area was equipped with intake and exhaust fans and a system of window controls. This permitted a complete change of air to be made every three minutes.

(*More Industrials on page* 172)

Lighting Installation Data

Finishing Area

Fixtures—35 units, 2-lamp, 75-w, slimline industrial. 7 continuous rows suspension mounted on 6-in. stems—Stems and canopies were installed so that finished ceiling can be put on in the future without moving any of the lighting fixtures—Spacing is approximately 7 ft 6 in. on centers—Ceiling height is approximately 10 ft

Lighting Level—80 to 90 ft-c

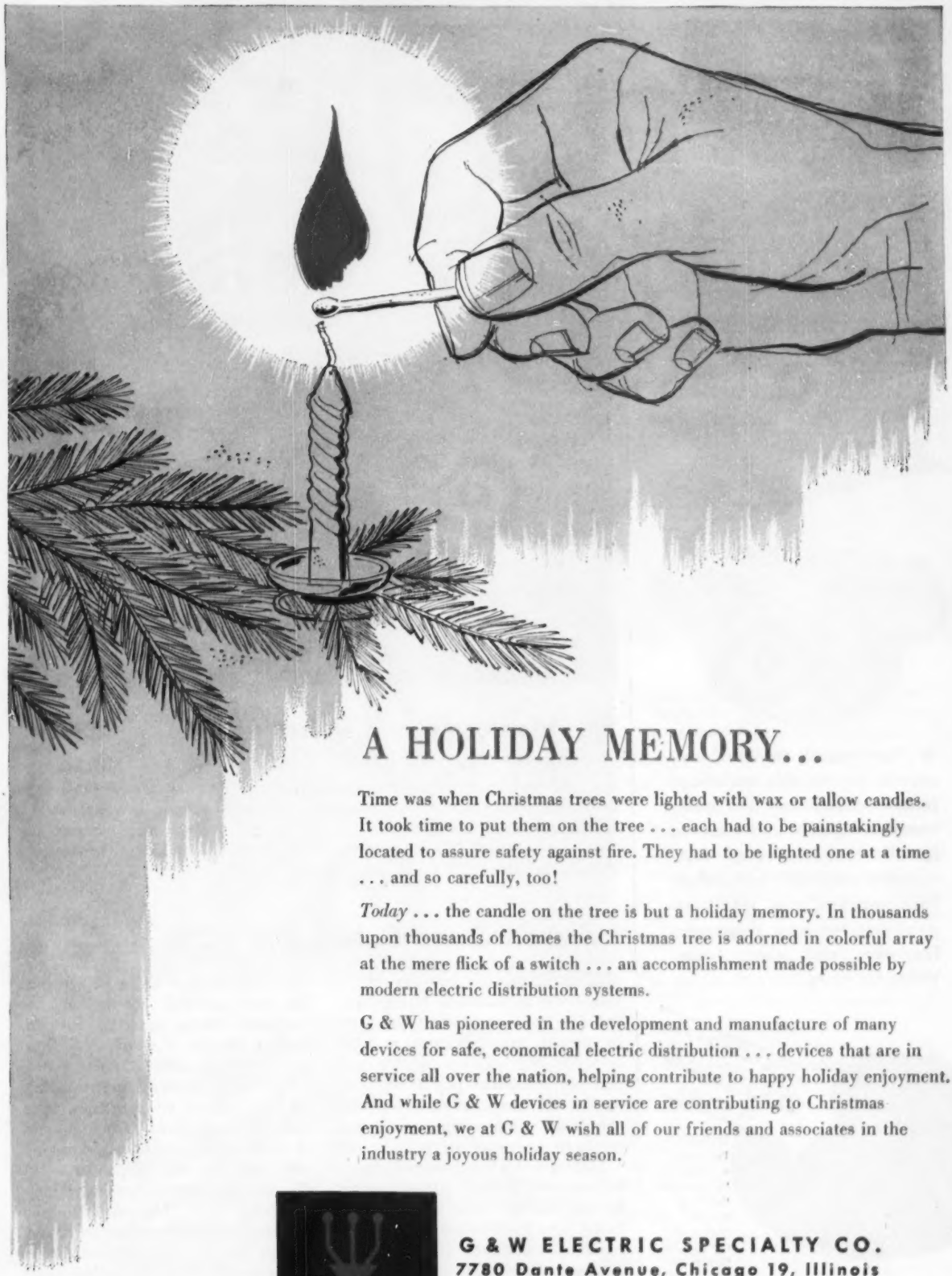
Sales Area

Fixtures—18 units, 2-lamp, 75-w, slimline commercial with louvers. 2 continuous rows, ceiling mounted approximately 9 ft 0 in. on centers—4 units, 150-w, matching downlites—ceiling height approximately 10 ft

Lighting Level—50 to 60 ft-c

Outdoor

Canopy—17 units, 150-w, recessed downlite, custom built on the job. Because the canopy is not parallel to grade level, these fixtures had to be installed with a gimbel ring fixture and extension ring and a special cut metal angle so that the fixture fits perpendicular to the ground.



A HOLIDAY MEMORY...

Time was when Christmas trees were lighted with wax or tallow candles. It took time to put them on the tree . . . each had to be painstakingly located to assure safety against fire. They had to be lighted one at a time . . . and so carefully, too!

Today . . . the candle on the tree is but a holiday memory. In thousands upon thousands of homes the Christmas tree is adorned in colorful array at the mere flick of a switch . . . an accomplishment made possible by modern electric distribution systems.

G & W has pioneered in the development and manufacture of many devices for safe, economical electric distribution . . . devices that are in service all over the nation, helping contribute to happy holiday enjoyment. And while G & W devices in service are contributing to Christmas enjoyment, we at G & W wish all of our friends and associates in the industry a joyous holiday season.

G&W

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois

Representatives in principal cities of U.S.A.
In Canada: Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

The Old Reliable

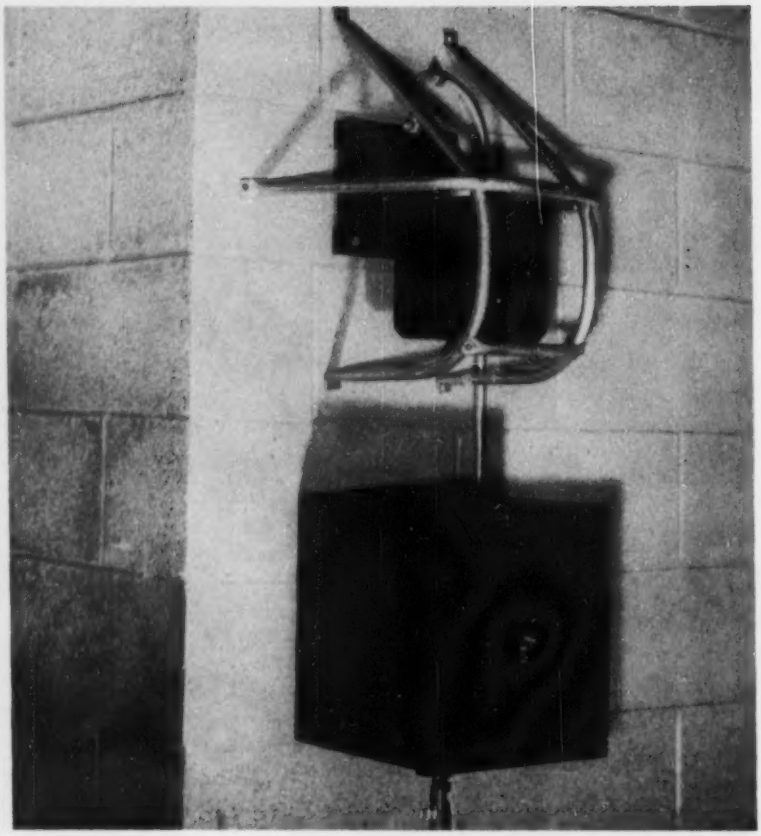
EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE
EVERSTICK
FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA



Electronics Guard Plant

A system of electronic units containing photo-electric tubes provides practical and positive protection throughout the manufacturing plant of Greenspan & Co. Inc., Philadelphia, Pa. The units form an invisible barrier against pilfering and vandalism through a network of light beams which automatically sound an alarm when interrupted at any point by an intruder. L. Albertson, Philadelphia Electric Co., Philadelphia, Pa.

Infrared Oven Cuts Costs 90%

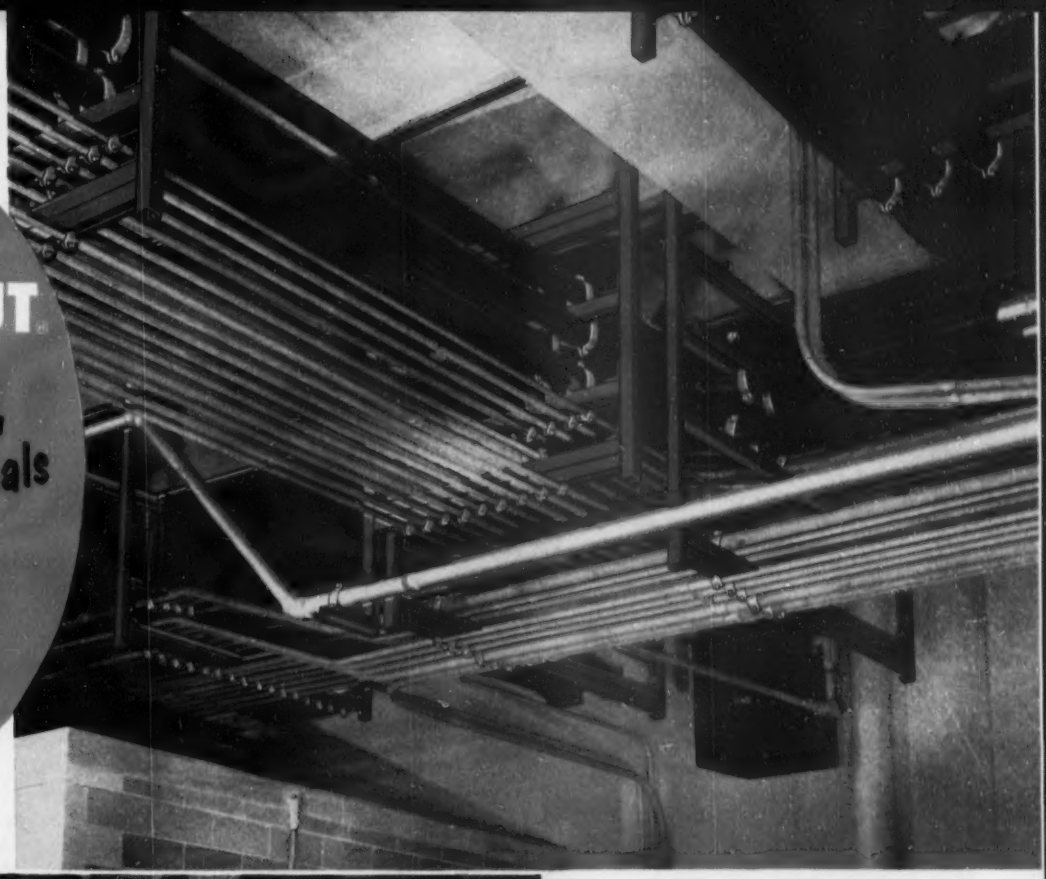
Heating aluminum castings in infrared oven at Automatic Firing Corp., St Louis, Mo, expands them sufficiently to permit motor stators to slide smoothly into housings—cutting total cost per completed unit from $7.50 to 75¢. The new method is considerably faster, provides better quality and results in no rejects due to burrs, etc.

Electric motor stators were formerly hydraulically pressed into the motor housing casting. Since the tolerances called for a 0.005-in press fit, it was a common occurrence for the stator ring to raise a burr during the pressing operation. This burr would collect on the ring seat with the result that the stator would be "cocked" (i.e. not parallel with the axis of the housing) and it would have to be pressed out, the burr removed, the housing remachined and the stator put back in.

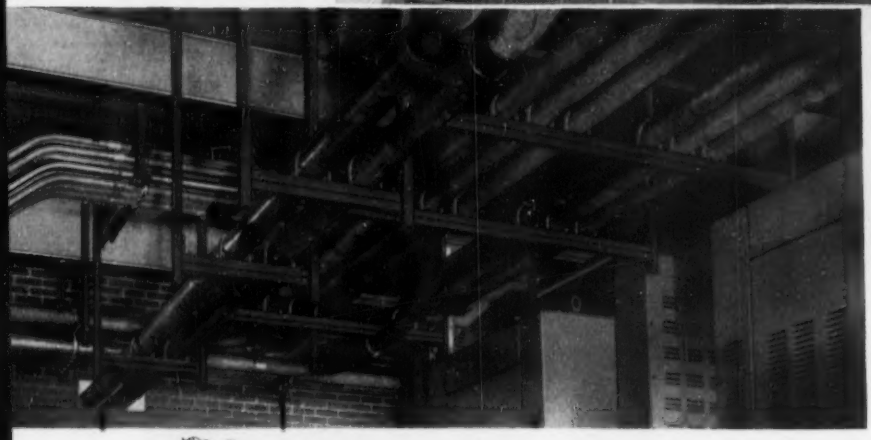
Oven consists of a cylindrical bank of 6 - 350-w reflector flood lamps. The casting, weighing approximately 35 lb, is placed on a rotating table centered in the oven. After 20 min of full heat, the casting has expanded sufficiently for the motor stator to slide smoothly into the housing with no burr being raised. The completed unit is then removed from the oven and allowed to cool while another operation is started. After the casting cools, the shrinkage gives a more solid and tighter fit than was possible when they were pressed in. Henry Matuschewsky, General Foreman

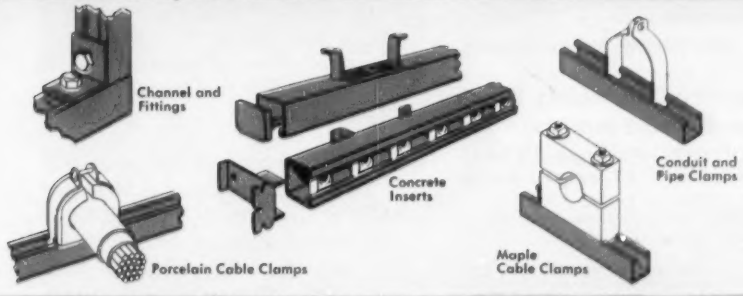
UNISTRUT concrete inserts, steel channel, fittings and clamps support maze of conduit in trapeze style framework.

ADJUSTABLE UNISTRUT FRAMING saves time, space, materials in large chemical plant



View shows how UNISTRUT nut and bolt assembly permits speedy erection, changes or additions at any time.





Conduit and Cable Installed Faster, Easier, for Less, at Kaiser Aluminum & Chemical Corporation's new Chalmette, La. plant

Versatile UNISTRUT steel structural supports reduce engineering detailing, permit rapid, on-the-job erection, allow changes or additions at any time.

This simple-to-assemble framing system consists of steel channel and fittings, clamps, brackets, hangers and concrete inserts—provides all you need to mount, frame, suspend or support all kinds of electrical equipment with just a hacksaw and a wrench.

No drilling, no welding, 100% adjustable and re-usable—there is no waste. Try UNISTRUT framing on your next job!

See our complete catalog in Sweet's Architectural, Plant Engineering and Industrial Construction Files.

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THE WORLD'S MOST FLEXIBLE ALL-PURPOSE METAL FRAMING

Write for FREE 84-page Pocket Catalog No. 800
For the MAN ON THE JOB. Photos, drawings, ideas and data on how to frame, mount, rack and support electrical and mechanical equipment with UNISTRUT metal framing.

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2337547 2375015 2345650
2363382 2380379 2405431
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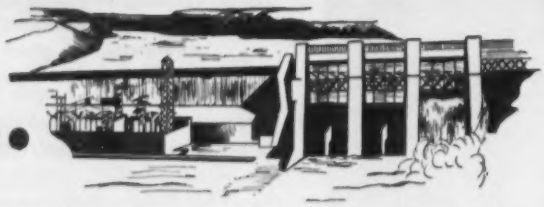
It's new!

IT'S BETTER . . . IT'S MADE BY

CONTROL CORPORATION

TM-15 TELEMETERING SYSTEM



BEST BY A DAM SITE—or anywhere you want to measure megawatts, RVA, water levels, gage readings—the TM-15!

FAST—TM-15 flashes 300 readings a minute to the receiving unit

ACCURATE—TM-15 based on precise time-ratio principle

RELIABLE—*unaffected* by voltage fluctuations

FLEXIBLE—TM-15 readings can be transmitted by microwave, radio, AC, DC

SELF-CONTAINED—no accessories needed with the compact TM-15

SIMPLE—TM-15 easily serviced by non-technical personnel

LOW INITIAL COST—LOW MAINTENANCE COSTS—the rugged TM-15 uses no expensive tubes, no fragile components, no complex wiring

The new TESTED TM-15 gives nearly instantaneous measurements for every phase of electric-power generating needs.

For complete information on how the NEW TM-15 can spark the job for you write or wire Control Corporation, 718 Central Avenue, Minneapolis 14.

CONTROL CORPORATION

723 CENTRAL AVE. • MINNEAPOLIS 14, MINN.

• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •

INDUSTRIAL BRIEFS

Low voltage correction by installation of 240 kvar in capacitors at Rathbone Hair & Ridgeway Co, Savannah, Georgia has eliminated motor down time and improved voltage at least 10% in worst areas. Excessive overheating of motors and uncertain production has also been eliminated. Installation cost of $3,200 was more than amortized within first year by increased production according to Robert Miles, Manager of the Company. Capacitors were installed on all large motors between the over current devices and the motor terminals. Additional capacitors were put at the ends of the plant feeders. C. D. Anderson, Power Sales Engineer, Savannah Electric & Power Co, Savannah, Georgia.

Variable speed drive automatically maintains proper speed and tension for a new 200-ft long paper corrugating machine at the Nivison-Weiskopf Co, Reading, Ohio. The drive has interlocking auxiliary electric control features which are necessary for the operation of this machine. The main drive motors are rated 120 hp, 480 v, 3 phase, 60 cycle, and are variable speed drives supplied by productive electric power along with a number of smaller auxiliary motors. The corrugating machine has three separate rolls operating at different speeds which can reach 500 ft per min. They must be perfectly coordinated in order to prevent tearing the paper. The machine corrugates one sheet of paper and pastes a facing sheet on both sides of the corrugated sheet, thus making boxboard stock. The machine then cuts each paper board to size and creases it so that it can be later folded into a box. L. J. Langevin, Power Engineer, Cincinnati Gas & Electric Co, Cincinnati, Ohio.

Drying paint on toys with additional 15-kw infrared lamp bank at Mellinger Mfg Co, Lancaster, Pa, makes possible increased production and reduced cost of operation compared with steam boiler previously purchased for this drying operation. Customer's original 10-kw lamp bank was insufficient to handle additional business. Jack Bidding, Industrial Power Representative, Pennsylvania Power & Light Co, Lancaster, Pa.

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SLEEVE
WITH THE
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TOOL
...GIVES YOU A
PERFECT NICOPRESS
SPLICE
For use on Copper, Copperweld, and
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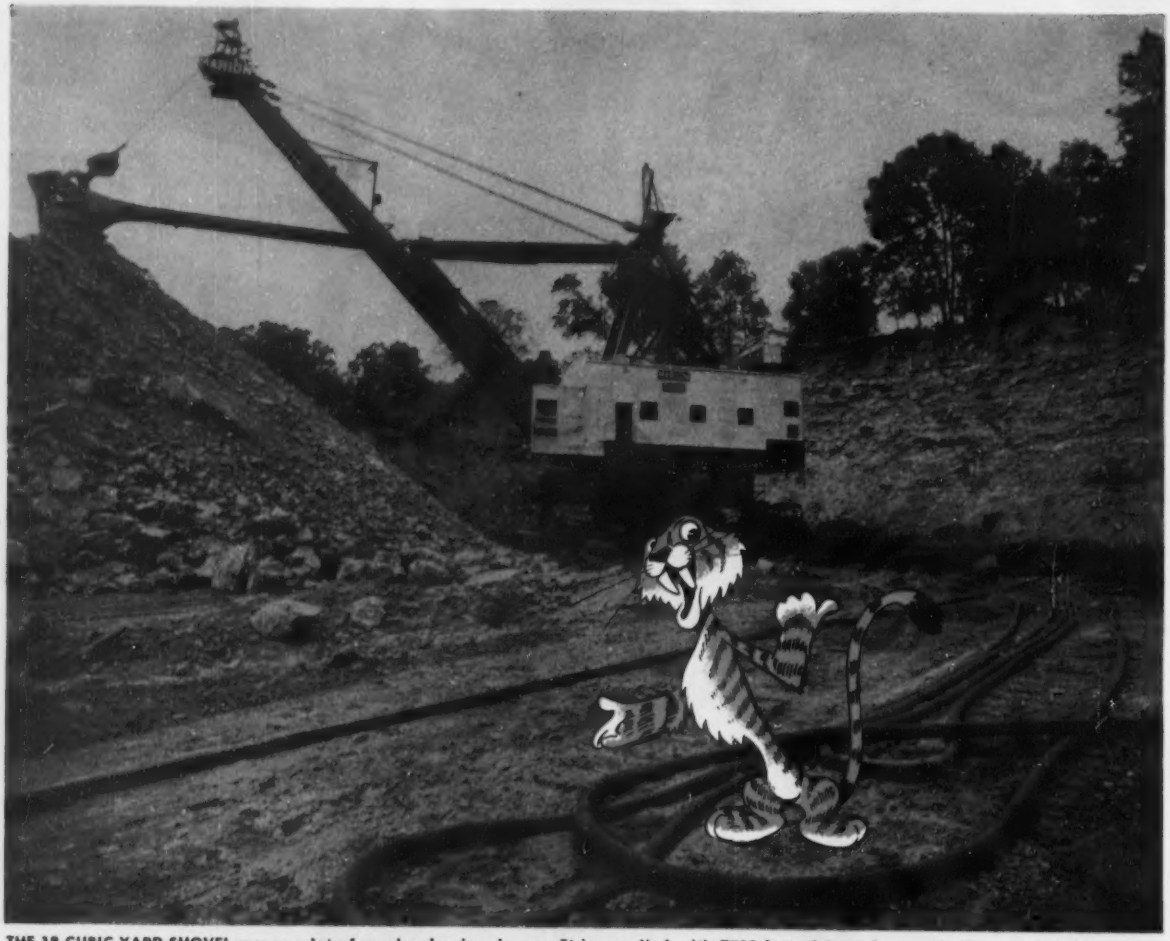
Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA
Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.
THE NATIONAL TELEPHONE SUPPLY COMPANY

They needed a top quality cable



THE 18-CUBIC-YARD SHOVEL moves a lot of overburden in a hurry. It is supplied with 7500 feet of 3-conductor 1/0 Tiger Brand Amerclad.

HERE IS THE MINE HEADQUARTERS. Wash tower is at center. Notice conveyor system at right that goes to power station over the hill.

like *Tiger Brand* for this high production strip mine

HERE IS A PORTRAIT of the 45-cubic-yard shovel that has removed most of the overburden at this mine.

IF you take a ride out near Zanesville, Ohio, someday, you'll spot the new Muskingum Mine—probably the most modern strip mine in the world. It supplies coal for the new 400,000 kw Muskingum River Plant of The Ohio Power Company, part of the American Gas and Electric System.

The big 18 and 45-cubic-yard electric power shovels operate day and night through sun, rain or snow. And when you consider the eye-popping cost of lost production time, it's easy to see why these shovels need the most dependable power cable on the market. At this mine, it's 100% Tiger Brand Amerclad.

The cable is always exposed to foul weather and accidental abuse. It often stretches for more than a *mile* from switchgear to shovel take-up reel. Yet, after more than 2 years on the job, the Tiger Brand Amerclad is in perfect condition without sign of wear.

If you need a cable that can *take it* . . . if you want cable for a power shovel, dredge, mine locomotive, welding machine or a heavy-duty electrical hand tool—you'll get more for your money if you specify Tiger Brand Amerclad. Drag it through puddles, over sharp rock; spill gasoline or oil on it and expose it to sun and ozone. Tiger Brand will still give you service you never thought possible. *Send the coupon.*

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paper & varnished cambric cable	shovel & dredge cable
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USS Tiger Brand **ELECTRICAL WIRE & CABLE**

USS

UNITED STATES STEEL

Heated Tank Speedily Cleans Serviced Equipment

A. E. KIRK, Appliance Serviceman, Kentucky Power Co, Ashland, Ky.

With an improvised electrically heated tank of detergent solution, cooking equipment and air filters are cleaned so quickly and effectively that the equipment has a new appearance when removed from the bath.

Tank is used to remove baked-on grease and scum from commercial counter-line cooking equipment serviced in our shop. It has proved equally effective in cleaning air filters used in our office heating and air-conditioning system. Wiring, thermostats and switches whose non-metal parts would be damaged by the hot solution are not immersed.

Advantages of using the thermostatically controlled detergent cleaning tank include the following:

1. Better utilization of man-hours in servicing.
2. Release of serviceman for more productive work in shop or outside calls during the soaking process.
3. Customer goodwill created by new appearance of serviced equipment and reduced outage.
4. Increased air flow through filters with less load on blowers.
5. Reduced drain on hot-water supply, quicker temperature recovery, and saving of fuel.

The equipment to be cleaned is soaked in a solution of the detergent maintained automatically at a temperature of 200 F. Counter-line equipment is soaked one to 1½ hr and then wiped dry to new-like cleanliness within 5 min or less than one-fifth the over-all time formerly required. Similar treatment of air filters removes all dirt and grime and reduces their pressure-drop to 0.1 in (water) or one-fifth of that obtained by the former cleaning method.

BAKED ON GREASE and scum on commercial cooking equipment is quickly removed in improvised tank. Four heating units total 8.5 kw

The improvised detergent-heating tank, equipped with four heaters, totaling 8.5 kw, will raise 79 gal of water to 200 F in one hour. The thermostat will maintain that temperature with considerably less power demand which might be further reduced by tank insulation if warranted. Energy consumption after maximum temperature is attained averages about 7½ kwhr per hr. The tank, using salvaged equipment, required 14 man-hours to construct and to equip for operation.

Win An EEI Award— Get Those Entries In

Do you have an appliance campaign that got eye-bulging results? A rural program you're proud of? An annual report that is not just another deadly tome?

These are the kind of things that can win in Edison Electric Institute's 1954 Prize Awards Contests just announced. Small companies as well as large ones can win cash prizes and/or trophies and plaques in nine different contests.

Seven contests are offered in the commercial field. They include: Thomas A. Martin Rural Electrification Award; George A. Hughes Award for electric range and water heating promotion; Laura McCall Awards for outstanding home service work; Planned Lighting Awards for raising community lighting standards; Frank Watts Awards for rural sales promotion; George Westinghouse Awards for electric laundry promotion; and More Power to America Award for industrial electrification.

A general folder describing the contests is being sent to utilities. All commercial entries should be sent to Edison Electric Institute, 420 Lexington Ave, New York 17, N. Y. Deadline is Feb. 1, 1955 for commercial entries other than the Watts, Martin and Lighting awards which allow until Feb. 15. Winners will be announced at EEI's Annual Sales Conference in Chicago next March.

Other awards outside the sales field include the Claude L. Matthews Award for valor and the Reddy Kilowatt Annual Report Award. They will be presented at next year's EEI convention in Los Angeles.

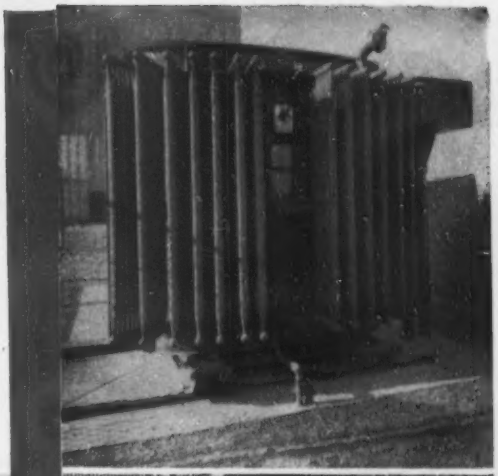
WWP Sells Cleaners

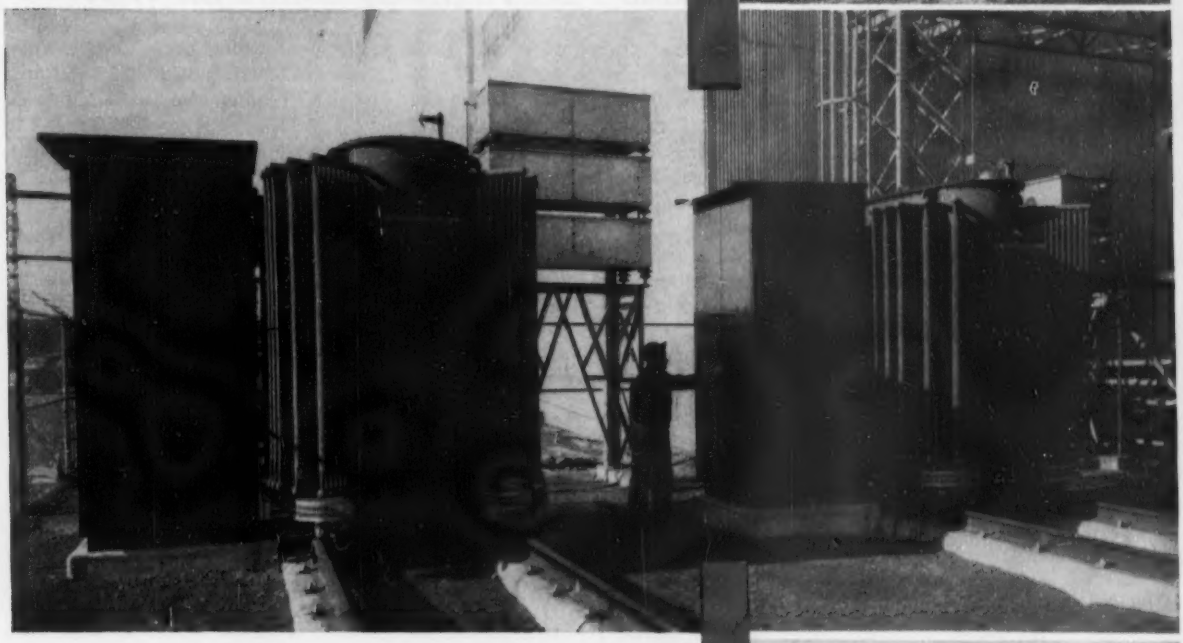
Washington Water Power Co is directly selling and promoting electrostatic air cleaners in a campaign scheduled to run to Dec. 31. Ordinarily not a merchandising company, WWP is selling the units in the absence of sufficient dealers. Dust reduction and pollen relief benefits are being plugged.

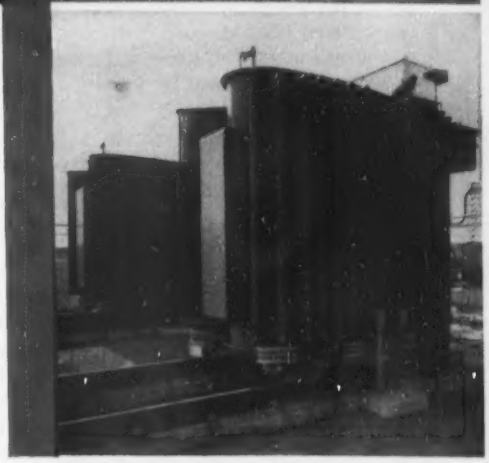
Farm Reprints

Extra copies of Electrical World's special 36-page farm section in this issue are available at 30¢ per copy; bulk prices on request. Address editorial offices of Electrical World, 330 W. 42nd St., New York 36, N. Y.

23 PENNSYLVANIA UNIT SUBSTATION TRANSFORMERS feed all 2400 volt lines at United States Steel's Fairless Works







19 — 2500 Kva and 4 — 3750 Kva Pennsylvania Transformers are supplying power at 2400 volts to operate open hearth furnaces, blast furnaces, hot and cold rolling mills, and coke ovens at the famous Fairless Works. Functioning as important components of I-T-E Unit Substations, these Pennsylvania Transformers assure an uninterrupted flow of power from the 13,800-volt power system to the 2400-volt distribution system.

Pennsylvania Transformer Company manufactures a complete line of power and distribution transformers, 3 Kva through 300,000 Kva, in voltages up to 330,000 volts.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • **Box 330** • **CANONSBURG, PA.** • **Phone Canonsburg 2380**

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Indiana Puts Highway Lights on Trial

Indiana is going all out to reduce highway accidents and is using electric lighting to help do the job. This is a picture of intersection of U. S. 52 and Indiana 100 where 25 10,000-lumen lamps have been erected as a first step in the state's new safety program.

Special lighting tests are planned at several highway locations where night time accident frequency has been unusually high. Lights, designed to ASA standards, will be installed at each of the danger points after which accidents will be tallied and then compared with previous records. This first trial installation is being followed by four others on which work has started. If there is a marked improvement in the night accident record at these points plans are to seek further highway lighting appropriations at the next session of the legislature.

Program is a joint effort by experts from the Indiana Electric Association's Highway Lighting Committee and a special state committee set up by Gov George N. Craig.

One of the studies conducted by the group involved the ability of a driver to spot highway intersections at night with and without lighting. The difference was so dramatic, when demonstrated to state officials and legislators, that it proved a big factor in getting approval for the trial lighting program.

San Diego Promotes Re-Wiring With Title I

Diverse industry groups have combined their forces to promote a long-term wiring modernization program in San Diego, Calif.

Headed up by the Electrical Contractors of San Diego, the program plugs for re-wiring of homes and buildings through use of FHA Title I home improvement and wiring loans. Several San Diego loaning institutions are cooperating.

C. J. Bunce, coordinator for the Electrical Contractors of San Diego, notes that the move is distinct from the National Adequate Wiring program. "This is designed more as a wiring and device promotion" he explains.

The Electrical Contractors of San Diego composed of contractors, distributors and manufacturers, is a division of the highly successful Bureau of Home Appliances of San Diego County. Both the contractors group and the wiring promotion are supported financially and through advertising cooperation by the San Diego Gas & Electric Co. But the utility does not operate the plan.

Bunce explains that the plan anticipates no quick results. But he recalls that for 20 years such a program has been needed. "We are trying to raise wiring standards generally," he said, "especially in the reconstruction field."

Campaign's advertising thus far has relied heavily on one-min and 20-sec television spots during Sunday professional football games.

(*More S & S on page* 193)

Solving load problems as more homes "go electric"

The past decade has seen utilities match the nation's tremendous housing expansion with corresponding system growth.

As more homes "go electric," the future points to increasing loads on these lines. On the following eleven pages, Mr. F. D. "Whitey" Hurd, Westinghouse Consulting and Application Engineer, and product experts discuss some specific ways you can meet this trend—on a practical basis.

On the next page, Fred Rick of the Meter Division leads off with news about the new meter socket . . .

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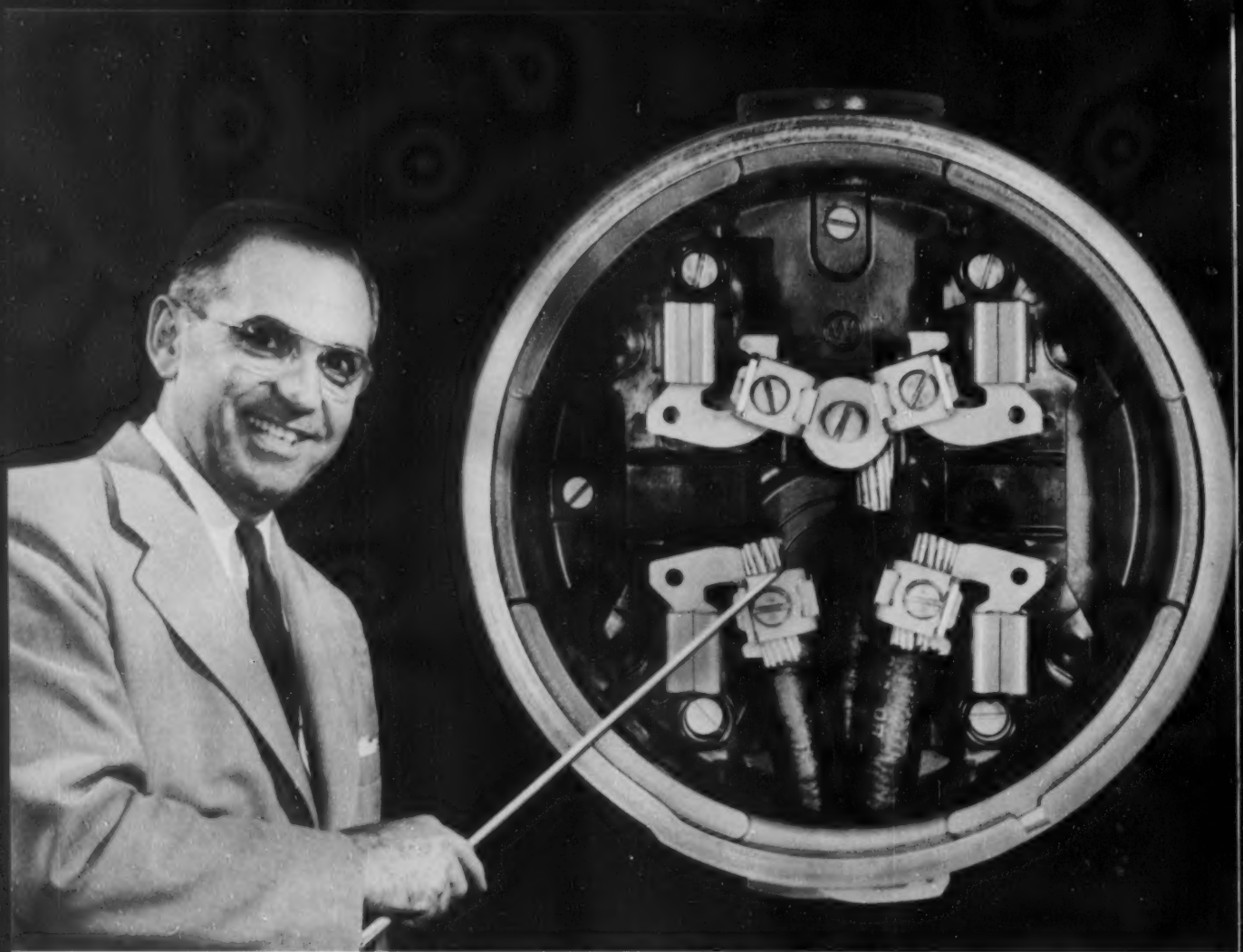


Fred Rick, Meter Application Engineer, shows how the new meter socket easily accommodates heavy conductors—up to #0 gauge.

New meter socket wires easily with up to #0 conductors

Heavy conductors up to #0 are no problem with the new Westinghouse die-cast aluminum meter socket. Wiring is simplified because of the new bus-type terminals. These terminals swivel for easy alignment with the conductors. On installations using heavy conductors, the tops of the terminals may be removed, conductors simply dropped into place, and the tops replaced. Smaller wires may be inserted into the terminals without removing the tops.

The socket has outside hubs to give more room inside for wiring. Terminals have large contact surfaces with "follow" action, insuring a solid connection on aluminum or copper conductors. All sockets have a breakout in the back for use when three-point mounting is required.

A new sealing ring which can be installed without tools is supplied with this socket. Since the socket, ring and meter rim are all iridited-aluminum, no electrolytic corrosion can take place.

The socket is available for either single or polyphase service with two or three outlets, in 1-inch, 1¼-inch and 1½-inch hub sizes. For more information, write for booklet B-6377, which contains the complete story about this socket.

YOU CAN BE **SURE**...IF IT'S

New secondary capacitors: 40% lighter, easier to handle

As they "power up" for modern living, America's homeowners are buying over a million air conditioning units a year. That looks good on load growth charts—but what about power factor?

The new Westinghouse 3 and 5-kvar secondary capacitors are the answer. They're inexpensive, light, easy to handle and completely flexible. They'll enable you to boost power factor on heavily loaded secondaries *at lower cost per kilovar than ever before.*

These new secondary capacitors offer you an exclusive cost-reducing design feature: tubular cases of 16-gauge extruded aluminum. They weigh only 16 and 25 pounds respectively—*40% less than comparable units.* A lineman can carry them up a pole and install them in a matter of minutes. They will never corrode —never need painting.

These capacitors can be mounted with bushings up or down—bolted directly to the pole or mounted on the crossarm with a standard EEI-NEMA bracket. Leads are furnished and, when required, external bushing-mounted indicating fuses can be supplied.

The use of secondary capacitors can be readily justified. You can prove this for your system by following the simple procedure outlined in a technical paper, *Application of Secondary Capacitors on Overhead Systems* by Hamilton Brooks. Write for it today.

Hamilton Brooks, Supervisory Engineer, Capacitor Section, with the new 3 and 5-kvar capacitors. Designed for use with 7½ and 15-kva transformers, the capacitors usually are placed about two-thirds of the distance from the transformer to the end of the line.

Austin Fink of the Switchgear Distribution Apparatus Department points out, on the next page, important economies for residential distribution lines.

Westinghouse

Austin Fink, Manager of Recloser, Cutout and Fuse Engineering, shows the standard 5.2-kv enclosed cutout box with its seven interchangeable doors.

Enclosed cutout interchangeability reduces distribution costs

One porcelain box—seven interchangeable doors! That's what you get with Westinghouse enclosed fuse cutouts—and it means a lot to you in the face of rapidly rising residential loads.

It means you don't have to change the entire cutout when fault or load current exceeds the rating of your present standard cutout. All you have to do is replace the door. It saves labor out on the line. Reduces inventory, too—for change of ratings, only the doors need to be stocked, not the boxes.

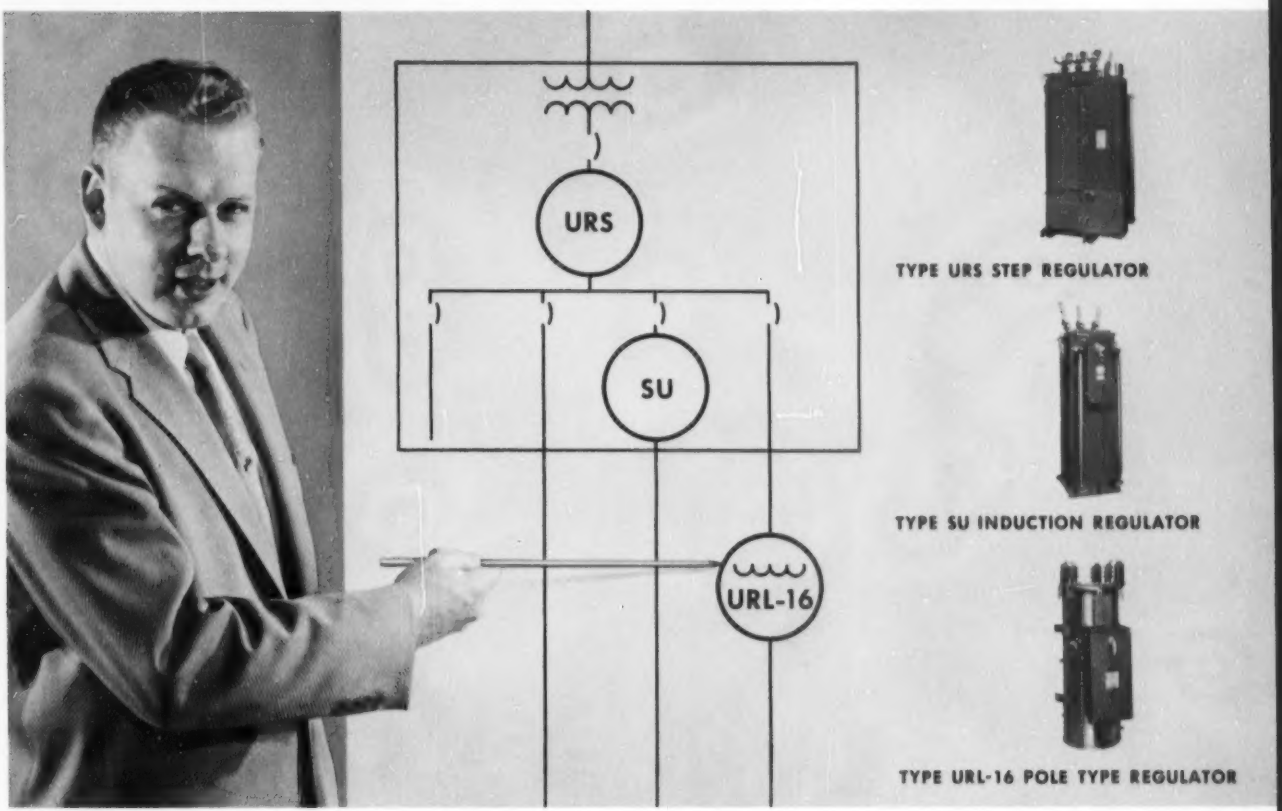
For 5.2-kv service, there are three ratings for one box: EA-50, the standard 50-amp, 1200-amp I.C. cutout . . . HC-50, a high-capacity 50-amp, 5000-8000 amp I.C. cutout . . . MC-100, a new 100-amp, 5000-8000 amp I.C. cutout. These three ratings are available in both dropout and non-dropout types. And there's a 100-amp disconnect blade. *Seven interchangeable doors—one porcelain box.* Equivalent number of ratings available for 7.8-kv service.

You can count on these additional benefits with Westinghouse enclosed cutouts: Exclusive Prestite® porcelain process insures proper fit of doors. Fewer joints in the current path mean less heating, less corrosion and longer life. On dropouts, the door swings through 180° for greater visibility and safety.

Complete facts are in DB 38-610. Write for it.

YOU CAN BE **SURE**...IF IT'S

On the line or in the substation . . . these regulators cut costs, improve service



Al Cleveland, Regulator Sales Engineer, with a single line diagram showing regulator applications.

The complete line of Westinghouse regulators makes it possible for you to apply either step or induction types to meet specific requirements throughout your distribution system.

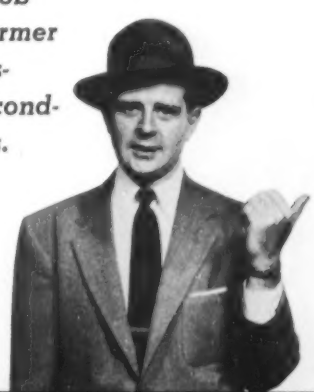
Very important in meeting growing loads is the URL-16—pole-type step regulator. This advanced 16-step regulator with its exclusive "inverse integrating" voltage regulating relay assures you *the closest effective bandwidth possible in any step-type regulator.* And it does it with fewer operations and simpler construction—for long contact life and minimum maintenance.

For station regulation, the SU induction regulator has proved its superiority with pin-point accuracy and absolutely minimum maintenance. SU "all-electric" control assures Class 1 accuracy and eliminates mechanical control adjustments. Just turn knobs on the convenient control panel.

Also for station regulation, the all-new URS is the most accurate, most compact, station-type step regulator you can install. A lifetime Class 1 "all-electric" control and separately compartmented, easily accessible tap-changer contacts are just two of the many features you should investigate if your load problems require the best station regulation.

In fact, wherever you want the best regulators, at no extra cost—to meet your specific load requirements—look to the complete Westinghouse line. Booklet B-6053 with complete product details and application data is available from your local Westinghouse representative.

On the next two pages Bob McCollom of the Transformer Division talks about transformers and banked secondaries in residential areas.



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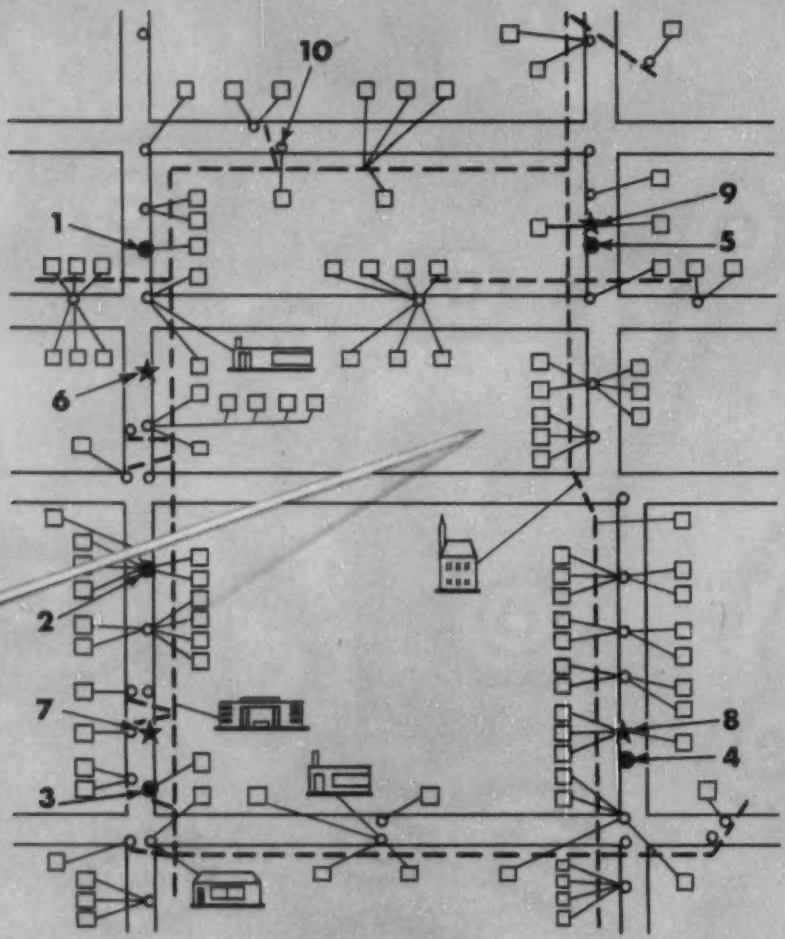
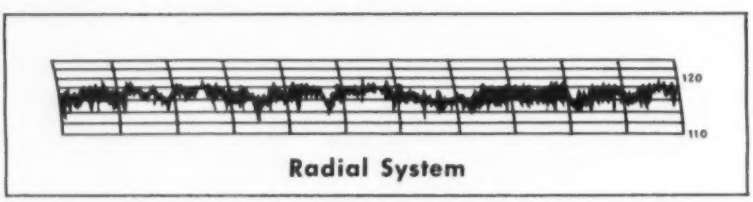
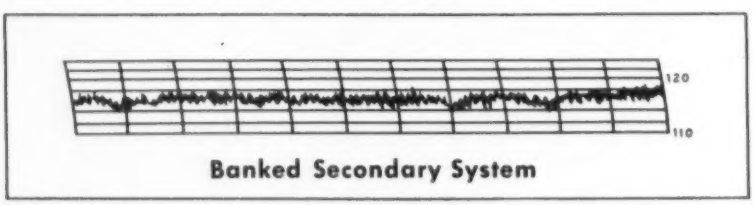
LOCATIONS OF TRANSFORMERS
(CONVENTIONAL AND "CSPB")







R. N. McCollom, Sales Manager, Transformer Division, points out utility test area with conventional transformers at locations 1, 2, 3, 4 and 5. These were replaced with "CSPB" transformers at 6, 7, 8 and 9. Instantaneous voltage dips at location 10 were recorded before and after "CSPB" transformers were installed. A 45% reduction was achieved.

BY ACTUAL TEST,

"CSPB"® transformers provide for load growth . . . improve regulation at lower cost

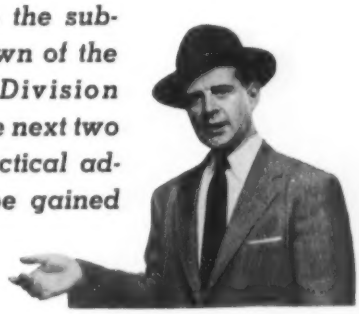
Actual tests conducted on well-defined load areas have proved the inherent superiority of the "CSPB" banked secondary system in handling growing residential loads . . . while improving voltage conditions at less cost.

The test area selected had five conventional transformers totaling 55 kva, serving 106 residential and five commercial customers. A survey of major appliances in use indicated that considerable load growth could be anticipated. Existing load and voltage conditions were recorded over a period of two months.

Following this, the five conventional transformers were replaced by four 15-kva "CSPB" units. Again, load and voltage conditions were recorded over a period of five months. The findings are tabulated in the load data table, below.

The result? Average voltage conditions were improved by 7% . . . with far less capacity than would have been required to make the existing radial system adequate. In addition, all of the benefits of "CSPB" construction were realized. For further information, write for booklet B-4310A which contains complete data for your application.

Moving back to the substation, Roy Brown of the Transformer Division points out, on the next two pages, how practical advantages can be gained there, too.



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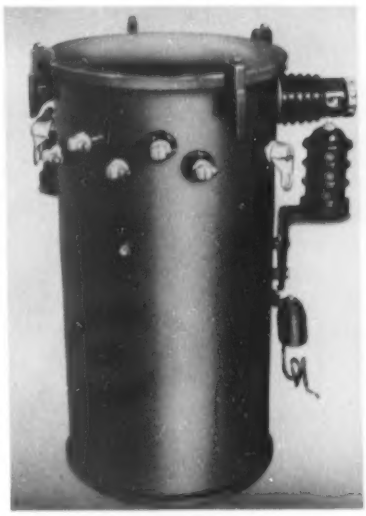
FOR RADIAL SYSTEM

Transformer No.	Kva Rating	Individual Load Peaks Kva	%	Transformer Loads at Time of Peak Load for System Kva	%
1	7½	11.04	147	8.40	112
2	10	12.96	130	11.52	115
3	7½	18.72	249	8.40	112
4	15	18.00	120	14.64	98
5	15	18.00	120	17.28	115
Tot. 5	55	78.72	147	60.24	110

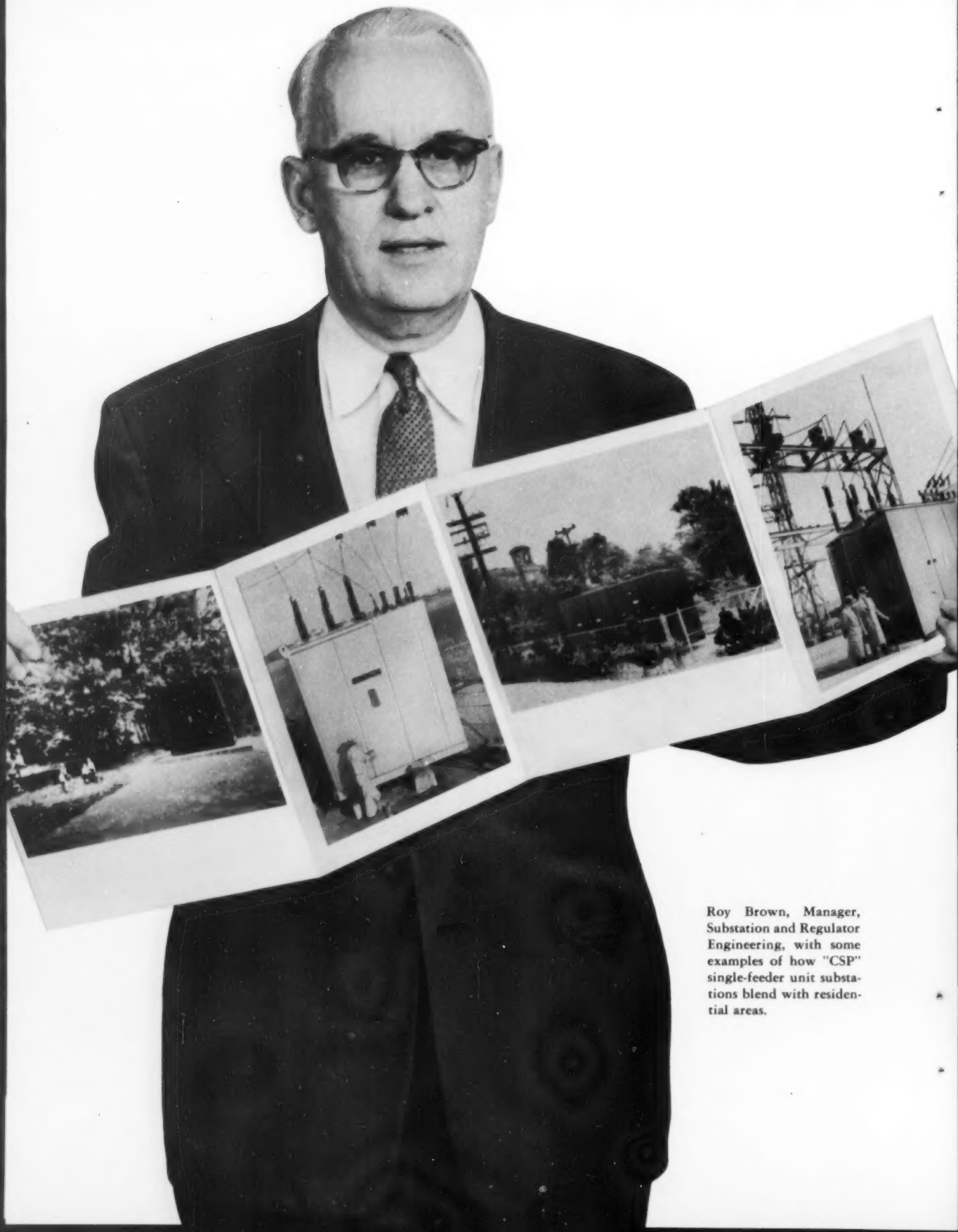
FOR "CSPB" BANKED SECONDARY SYSTEM

Transformer No.	Kva Rating	Individual Load Peaks Kva	%	Transformer Loads at Time of Peak Load for System Kva	%
1	15	17.28	115	14.88	99
2	15	17.76	118	17.28	115
3	15	15.84	105	15.84	108
4	15	15.84	105	14.40	96
Tot. 4	60	66.72	111	62.40	104

Peak load data table shows more uniform load distribution in banked secondary system. Same load growth on radial system would have required much more than the 5 kva added with "CSPB" transformers.



"CSPB" distribution transformer for banked secondary system has built-in lightning, short circuit and overload protection. A system of "CSPB" transformers cannot cascade.



Roy Brown, Manager, Substation and Regulator Engineering, with some examples of how "CSP" single-feeder unit substations blend with residential areas.

Flexible substation . . . makes a good neighbor

For single-feeder substations—in residential areas—the Westinghouse "CSP"® power transformer is a logical choice because of these significant points:

Residential Acceptance — Because the "CSP" power transformer is compact, attractive, quiet and safe, it makes a good residential area "neighbor". You can locate substations to achieve best system efficiency—with less likelihood of objections arising from residential or commercial restrictions.

Factory Coordination—You place a single order and get in one compact unit, a complete single-feeder substation with the 43 components of a conventional substation built in, coordinated and tested at the factory. You eliminate all the time-consuming shipping, expediting and installation coordination necessary with conventional substations.

Simplified Installation—The "CSP" power transformer requires a minimum of real estate . . . and only one foundation. Unload it—tie in transmission and feeder lines and it's ready to go—with complete lightning, surge and fault protection, automatic voltage regulation, load switching and metering. Site-erected substation installation time is reduced 4 to 1. Landscaping is made easy.

When loads are increasing, additional "CSP" power transformers can be easily added. When loads shift, they can be easily and economically moved—with full salvage value. Booklet B-4692 includes still more advantages. Write for it.

On the next two pages Herman Barsun of the Transformer Division discusses substation regulation in relation to your residential load problem.

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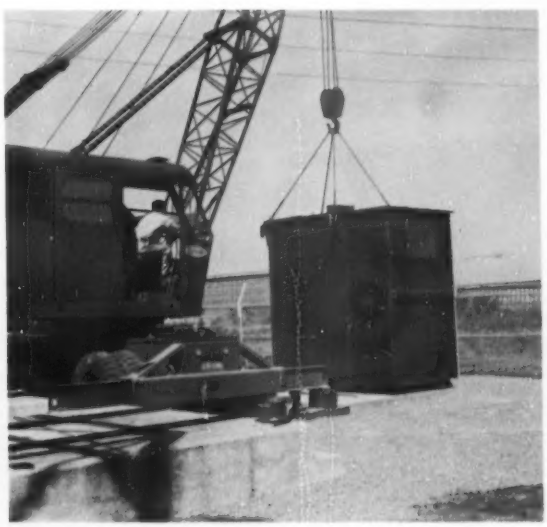


Installing a "CSP" single-feeder substation is a simple process because it is delivered *complete* in one shipment. Unload it—tie in transmission and feeder lines—and it's ready to go.

Herman Barsun, Section Manager, Regulator Section, Transformer Engineering, exhibits the compact orderly construction of the new URS load tap changer.

Consumer satisfaction demands accurate substation regulation

Well-regulated utilization voltage at your customer's service entrance depends on accurate and reliable regulation at the substation level. Whether you are considering "CSP" power transformers, unit substations or standardized power transformers, the URS load tap changer assures you not only accurate and dependable voltage regulation but *quiet* operation as well.

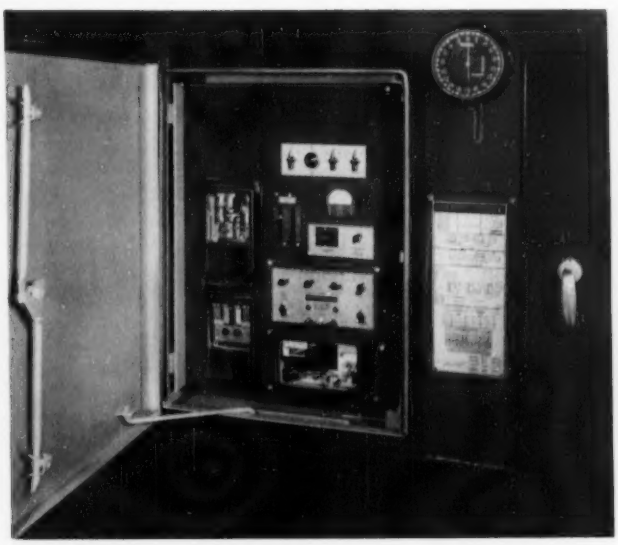
Contributing to both quiet and dependable operation, the Geneva gear drive is the heart of the URS operating mechanism. Contacts move at the optimum speed to prevent burning, yet are accelerated and decelerated smoothly for shockless operation.

You will also appreciate the improved appearance of the new URS housing. The control cabinet is an integral part of the tap changer, resulting in minimum size and weight. All control devices are mounted on a hinged steel panel assuring maximum convenience for operation and maintenance.

The control cabinet contains the new SJS voltage regulating relay. Simple, dial-operated, all-electric settings eliminate mechanical adjustment devices. Hinge-spring construction eliminates pivots and bearings. Factory sealed—not even contact dressing is needed.

Your local Westinghouse representative will be glad to discuss further details of the new URS load tap changer with you.

YOU CAN BE SURE...IF IT'S Westinghouse



Hinge-mounted for easy accessibility, the integral control panel includes SJS voltage regulating relay, time delay relay, motor control relay, and manual control provisions. Operation and maintenance are simplified.

Complete SJS voltage regulating relay is mounted with four bolts and wired through plug-type connectors for ease of routine testing. All-electric settings eliminate mechanical adjustment devices.

D. N. Reps of Electric Utility Industry Engineering worked out the hypothetical equivalent system that solved this particular problem.

"Equivalent systems" analysis solves feeder-voltage problems

"A medium-sized city in the midwest faced a problem that is becoming increasingly common as more homes 'go electric'.

"It was apparent that the present 2400-volt feeders would soon be overloaded, and the utility was concerned about regulation and outages that could result in loss of goodwill, as well as revenue.

"Together with the utility engineers, we went over the problem in detail, even surveying the area to determine geographical and physical factors. Armed with this information, we took the problem to the Distribution Engineers at East Pittsburgh for solution by the unique method of constructing a hypothetical equivalent system. Thus, comparable voltage levels and substation ratings could be checked, yielding results applicable to the actual system.

"The results of this study clearly showed that optimum economic design could be achieved by changing over to 4160 volts. The utility is now in the process of making the change-over . . . ample proof that they were pleased with the study."

These and many other facilities, backed up with broad Westinghouse experience, are available to you, around the clock. For any generating, transmission or distribution problems you might encounter, resources like these are priceless. CP-1022

For additional information or literature on any of the products discussed on the preceding pages, contact your local Westinghouse representative, or write direct to Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE... IF IT'S Westinghouse

S & S Shorts

One Demonstration—40 Ranges Sold

"Homemakers Extravaganza" demonstration sold 40 electric ranges—and they expect more—for Tom & Jerry's TV and Appliance in Hastings, Neb. Advance radio and newspaper advertising brought 2,500 persons to city auditorium and 500 more that had to be turned away. Closed circuit TV (to enable those attending to see themselves on the screen) plus prizes of five ranges, 20 radios and a dozen hams were used.

Beats Its Quotas

Florida Power & Light Co's two-month campaign ended up with sale of 4,971 electric water heaters and 4,555 combination refrigerators against quotas of 4,000 set for each.

Xmas Home Lighting Contest

A Christmas lighting contest with $5,000 in prizes is being sponsored this year by General Electric Co's Lamp Division in cooperation with local chapters of the U. S. Junior Chamber of Commerce and other civic organizations. It urges people to decorate their homes with light.

Latest Cincy Plan Tally

Latest available score on Cincinnati Gas & Electric Co's "Wire on Time" plan: after 12 months 809 jobs totaling $198,477 from 225 contractors have been financed.

Shorties . . .

Kansas Gas & Electric is pushing portable lamps in a "Light for Living" promotion which features "starter sets" (lamp package with bulbs), and lighting demonstrations. Customers receive bonus certificates worth a free wall lamp if they buy $25 worth of other lamps . . . Rewiring soon will be a safety must for homes wired before 1940 says A. H. Welkin, Chicago safety expert. . . . "Hospital Dietary Services," a text book outlining hospital food service requirements has been published by Hotpoint Co. Book emphasizes use of electrical equipment and is available from Hotpoint's Commercial Equipment Department, 227 S. Seeley Ave, Chicago 12, Ill.

More than 2,000 ways to build load with heating, ventilating and air conditioning

12TH INTERNATIONAL HEATING & VENTILATING EXPOSITION

Air Conditioning Exposition

COMMERCIAL MUSEUM • PHILADELPHIA

JANUARY 24-28, 1955

That's what you'll find at the 12th AIR CONDITIONING EXPOSITION where over 400 leading manufacturers in these fast growing fields will demonstrate over 2,000 new and improved products. There'll be answers to your problems of power requirements for new systems and practices in conditioning air in all types of buildings. This 5-day concentration of up-to-the-minute information will provide you with the new ideas for building load through air conditioning.

PLAN NOW TO ATTEND

Look for your answers from exhibits, demonstrations, technically qualified personnel, comparisons of competitive products, on-the-spot estimates of power requirements, available technical data and in other time-saving, cost-saving ways.

Under the auspices of the American Society of Heating and Ventilating Engineers

Write for advance registration

Management: International Exposition Co., 480 Lexington Ave., N. Y. 17, N. Y.

AUTOMATIC CONTROL SYSTEM for operation of power plants is demonstrated by W. H. Sisson, power industry manager for Minneapolis-Honeywell Co, whose engineers developed it

Load Control System Devised

Minneapolis-Honeywell announces new automatic electronic method of regulating power plant operation. Low-cost foreseen

An electronic load and frequency control system capable of automatically "masterminding" the operation of generating stations has been developed by Minneapolis-Honeywell Regulator Co's Industrial Division, Philadelphia.

The new system uses self-correcting electronic controls to regulate a power plant's output and frequency in accordance with electrical demand changes. It is said to be fast acting, accurate, and less complicated and expensive than earlier electronic models. Signals to each station require only one channel.

The system has an unlimited range. It can be built into new or existing power plants, either steam or hydroelectric. It uses wire, carrier, or microwave forms of transmission.

Honeywell engineers believe that the modular construction of the new system will result in relatively low-cost installations.

Functioning much like an "automatic dispatcher," the new system achieves accurate, high-speed control through individual servo units which supervise three different methods of control. Signals, or "pulses," characterizing load swings—caused by variations in demand—are telemetered to the servo units. They electronically compare the signals with the standard operating levels. If a discrepancy is detected, they initiate control action—by adjusting the turbine governors—to bring the system load and frequency back to normal.

The individual servos are interlocked, chain-fashion, to provide cumulative control of the system.

Telemetering totalizers are incorporated in the system to tally up the power measurements. Such totals are needed for area and net load readings.

B&W Buys Globe Steel

Babcock & Wilcox Co, New York, has purchased the assets and business of the Globe Steel Tubes Co., Milwaukee, according to a joint announcement.

B&W stated that it will operate the Milwaukee plant as part of its Tubular Products Division and plans having key personnel and production workers to continue as B&W employees.

Aquisition of manufacturing facilities of seamless and welded stainless, alloy and carbon steel turbing, aircraft tubing, pressure tubing and welding fittings, will increase the variety of products of B&W's Tubular Products Division.

Line Hardware Group Organize Association

The Line Hardware Institute, an organization of manufacturers of pole line hardware, held its first meeting recently in Pittsburgh. Members of the new group are the A. B. Chance Co, Electrical Manufacturing Co, Hubbard and Co, Joslyn Mfg & Supply Co, Line Material Co, Oliver Iron & Steel Corp, Seyler Manufacturing Co and Utilities Service Co. Frank H. Baxter Associates, management consultants of New York City, has been retained to assist this association.

The Institute has been organized to engage in any and all endeavors that will standardize and improve the pole line hardware products and otherwise assist the customers of these manufacturers. Officers for the organization will be elected at a meeting to be held early in 1955.

REA Adds Glass Insulators

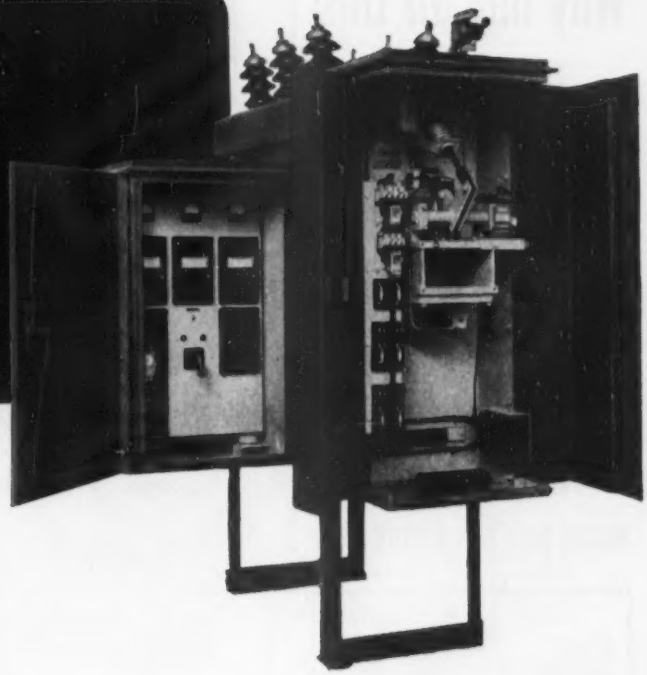
Tempered pin-type glass insulators, manufactured by Kimble Glass Co, subsidiary of Owens-Illinois Glass Co, have been accorded final acceptance by the Rural Electrification Administration of the U. S. Department of Agriculture. Recommendation for final acceptance was made by the REA Technical Standards Committee "A", and the insulators are now added to the list of materials acceptable for use on systems of REA electrification borrowers.

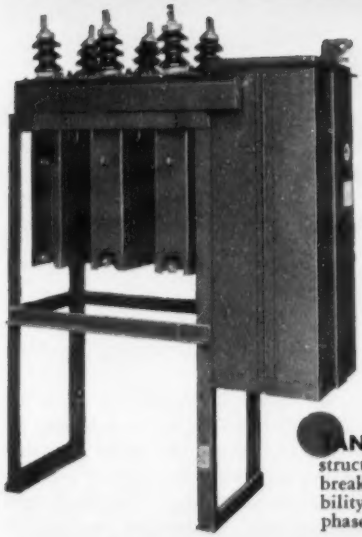
Affected by this REA acceptance are Kimble's tempered glass insulators No. 820 and 830, both for use on power distribution lines.

(*More M & M on page* 196)

Get the breaker with these PLUS FEATURES

Here's increased operating convenience with high safety factor

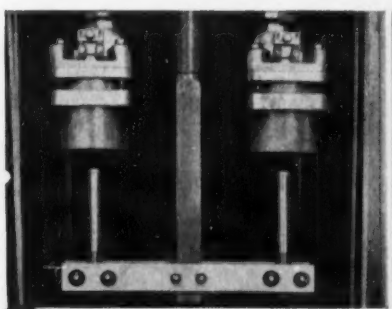


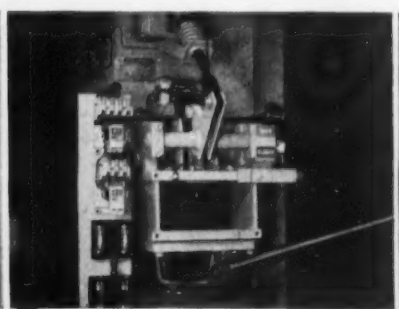


TANK PER PHASE construction — as used in large breakers — eliminates possibility of internal phase-to-phase flashover.

ACCESS FROM THREE SIDES. Side hinging of L-shaped doors allows side as well as front access to operator cabinet. Operator is high speed solenoid type — mechanically and electrically trip-free. Linkage is basically same as used on large A-C breakers.

NO FALSE OPERATION of relays. Operate the breaker — slam the door — or let the wind slam it and relays can't operate accidentally. Relay panel is in separate cabinet from operating mechanism and is 4-point mounted on shock absorbers. No hinge wiring either! Separate door in rear of cabinet provides access to back of relays.





TULIP AND BAYONET CONTACTS are self wiping, self aligning. Note also, double break per pole design and time-proved *Ruptor* interrupting device are used. Here again, Allis-Chalmers is using the same quality construction as is used on large A-C breakers.

VISIBILITY PLUS. Maintenance closing device is side operated. Man closing breaker can observe contacts and man working on them. In addition, external position indicator easily visible at a distance from front or side. Inside position indicator also provided.

NO BURIED LEADS. Simply remove three pins at bottom of fabricating wiring duct to expose bushing current transformer leads. No conduits, pipes, fittings to remove. This is just one more feature that makes this the outstanding distribution-type breaker today.

GET COMPLETE INFORMATION. Call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

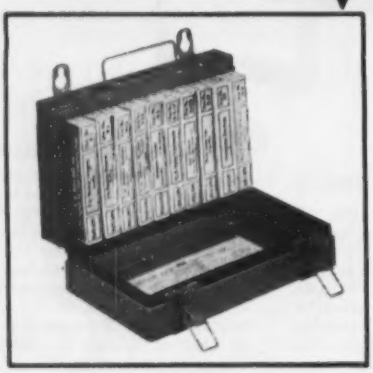
A-4255

Ruptor is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Why buy all this ↓

when you need only this ↓



Hundreds of dollars are being saved yearly by users of Bullard First Aid Kits. Bullard's wide selection of standard kits planned to meet the accident patterns of specific industries means you get the benefits of custom designed kits without paying premium prices. Write today for the new Bullard First Aid catalog . . . discover how you can save spoilage and waste resulting from unused and unnecessary first aid supplies.

Send me your new folder, *"Custom Designed First Aid at standard prices."*

NAME.....

ADDRESS.....

CITY.....ZONE.....

STATE.....

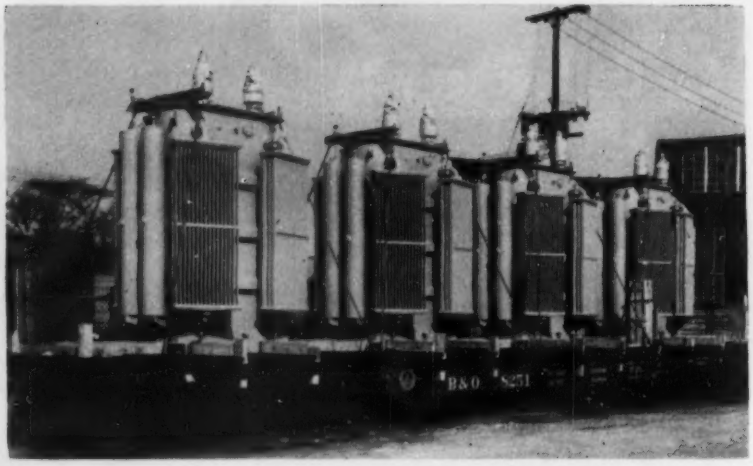
E. D. BULLARD COMPANY

275 Eighth Street
San Francisco, Calif.

Since 1898

T. M. REG. U.S. PAT. OFF.

EVERYTHING BULLARD IN SAFETY



Largest Order Starts for Los Angeles

Largest single order of identically rated transformers received by Standard Transformer Co from one customer is started on its journey. Shown is one of three carload shipments covering twelve transformers for the City of Los Angeles. The OISC units are rated 2,500 kva, single-phase, 34,500 v-2,400 × 4,800 v, were built to LA's specifications and will be installed in substations.

Norma-Hoffman Forms New Walker Division

Norma-Hoffman Bearings Corp, Stamford, Conn. announces the formation of the Walker Division. This new division manufactures selenium rectifiers and closely regulated power supplies for industries requiring direct current. In addition, other electrical equipment will also be manufactured.

The Walker Division is headed by Dr. Harry N. Walker who has been appointed vice president of Norma-Hoffman Bearings Corp.

To Export, Americans Must Meet Standards

American businessmen may soon be unable to compete for international trade—goods made in the United States are useless for export unless they conform to the standards of the countries to which they are exported, Roger E. Gay, president, American Standards Association, said in addressing the 36th Annual Meeting of the American Standards Association, Nov. 15. He spoke to representatives of national trade associations and companies attending the Fifth National Conference on Standards, in New York.

Mr. Gay emphasized that unless the country's industry makes a formal attempt to present the American side of the standards movement, we may find ourselves facing a situation where international agreements among 30 or more closely allied foreign countries would cause insurmountable barriers to the outward flow of U. S. goods or services. Gay is also president of Bristol Brass Corp, Bristol, Conn.

John R. Townsend, Bell Telephone Laboratories, and president of ASA's Standards Council also warned industrialists on letting the breach widen between the marvelous discoveries in science and the use industry is making of them.

Science is now in possession of technical and scientific information which can be used in the improvement of products and processes, development of new manufacturing techniques and products, Mr. Townsend pointed out.

"The Standards Council has established procedures whereby American industry, technology and government can participate fully in the international standardization work designed to unify national standards and thereby permit a free exchange of goods and services," Townsend added.

The data you need easy to find in this Uptegraff

ENGINEERING MANUAL

Designed for quick reference, this manual gives in easy-to-find form, dimensions, performance data and other essential information on Uptegraff Power Transformers of all commercial ratings from 750 to 10,000 KVA. It describes liquid-filled, single and three-phase transformers up to the 67 KV Class. Standard and optional accessories are listed; terminal arrangements, vector relationships and schematic representations are shown.

Copies of this engineering manual will be useful in many ways in executive, engineering and operating departments.

R. E. Uptegraff Manufacturing Co.
Scottdale, Pennsylvania

Send for free copy of this useful Uptegraff Power Transformer ENGINEERING MANUAL. Write on company letterhead or use the coupon below.

R. E. UPTEGRAFF MANUFACTURING CO. (EW)
Scottdale, Pennsylvania

Gentlemen: Please send a free copy of your ENGINEERING MANUAL Bulletin 133 to:

Name _____ Title _____

Company _____

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ANOTHER

Royal

FIRST!!!

★

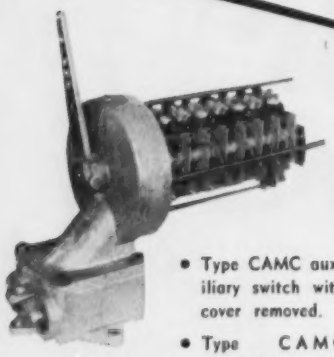
TYPE CAMC

MERCURY

AUXILIARY

SWITCH

★



• Type CAMC auxiliary switch with cover removed.

• Type CAMC switch with weather-proof cover.

ANOTHER original development in the power switching field, this new mercury auxiliary switch has several advantages. Being sealed in glass, the mercury contacts are unaffected by dirt or corrosive atmospheres, and are therefore completely reliable even at the lowest control circuit voltages. The unit is designed for mounting directly on a group-operated air-break switch, rather than on the actuating mechanism, assuring correct control-board lamp indication of the position of the switch blades. The new auxiliary switches are available in 4, 8, and 12 SPST contacts, and are adaptable to use on all standard makes of group-operated switches.

Other ROYAL "Firsts" include

First braid-less vertical air-break switch, 1936.
First braid-less side-break switch, 1939.
First hydraulic switch operating mechanism, 1948.
First compact, low-cost electric counter, 1938.
First to use a maintenance free, corrosion free, permanently sealed main switch bearing, 1949.

Royal

A Part of the Arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING COMPANY

INCORPORATED

1122 EAST 87th STREET Chicago 19, Ill.

Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

The session on International Standards and What They Mean to the Electrical Industry, was held during the Fifth National Conference on Standards. Here was presented the American viewpoint of the accomplishments made during the meetings of the International Electrotechnical Commission in Philadelphia in September.

R. C. Sogge, General Electric Co, Schenectady, N. Y., president of the United States National Committee presided. Addresses included: "Components for Electrical Circuits," Leon Podolsky, Sprague Electric Co; "Organization and Work of the IEC on Electrical Insulation Material," Dr A. H. Scott, National Bureau of Standards; "Progress in Power Switchgear," V. L. Cox, General Electric Co; "New Developments in Electron Tubes," Virgil Graham, Radio-Electronics-Television Manufacturers Association; "Development of World-Wide Turbine Standards," B. C. Thorn, International General Electric Co; "What the Future Holds for International Standardization" — Dr Harold S. Osborne, president, International Electrotechnical Commission.

New Division Created By Hoffman Machinery

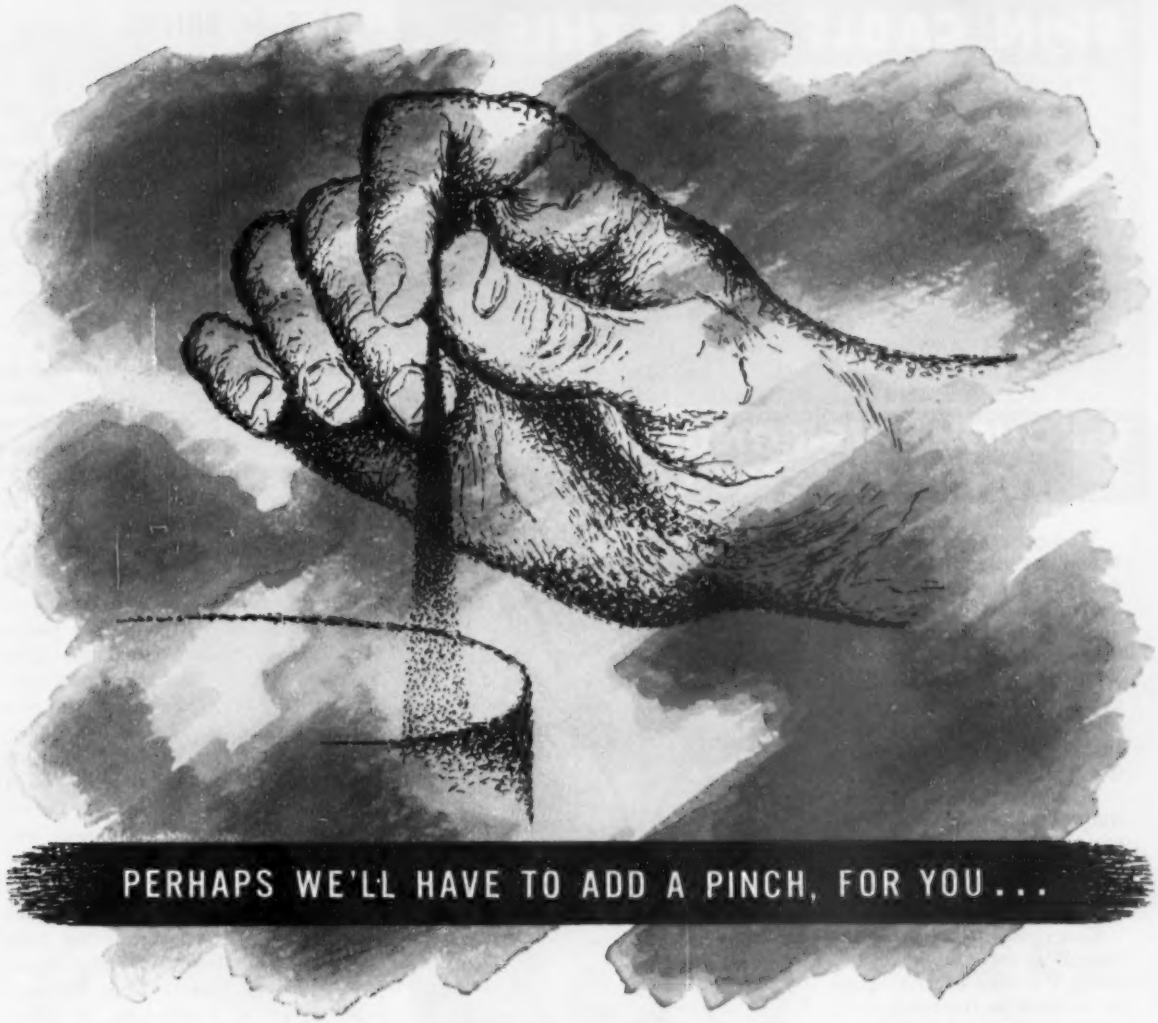
United States Hoffman Machinery Corp has formed the Industrial Equipment Division, with Revis L. Stephenson, vice president in charge. The new organization according to Hyman Marcus, president, will be in effect as of December 22. Main office will remain at 105 Fourth Ave, New York.

The new division is a combination of the Air Appliance and Industrial Filtration Divisions. Manufacturing will continue in Syracuse, N. Y., for oil conditioners for transformers, circuit breakers and turbines; centrifugal compressors and vacuum producers; industrial vacuum cleaning equipment; continuous strip drying equipment; and magnetic separators for coolant clarification.

MANUFACTURING BRIEFS

Pyrene Mfg. Co and its affiliate, C-O Two Fire Equipment Co, are furthering their unification program. En-

(*Continued on page* 200)



PERHAPS WE'LL HAVE TO ADD A PINCH, FOR YOU...

Just ask us for an alloy we haven't got — we'll be delighted.

Because that's how each of the more than 80 resistance and electronic alloys Driver-Harris makes had its beginning. Each of these highly specialized alloys is custom-made . . . produced exactly to the specifications of our customers.

The physical and chemical properties of an electrical resistance alloy can be altered greatly by a minute difference in its constituents. Often just a few ounces to the ton can make the difference you need.

One thing you can always rely on in any Driver-Harris alloy: it is made to the most precise metallurgical checks and controls known to the industry. It is these exclusive quality controls that have made Nichrome V and Nichrome* the standard for over 50 years by which all other electrical resistance alloys are measured.

Perhaps in a sense Nichrome is *too* well known. For we don't want people to forget that we make many other resistance alloys of sustained high quality to meet other special needs. And that, as we said at the outset, our engineers will be more than delighted to start afresh tomorrow to devise a new one, custom-made for you. Just tell us as exactly as you can what you wish to accomplish.

NICHROME V and NICHROME are manufactured only by

Driver-Harris Company

HARRISON, NEW JERSEY

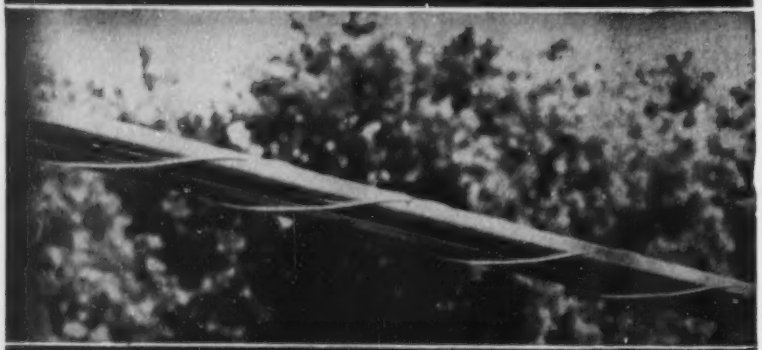
BRANCHES: Chicago, Detroit, Cleveland, Louisville, Los Angeles, San Francisco

In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario.

*T. M. Reg. U. S. Pat. Off.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

SPIN CABLE LIKE THIS...



THROUGH TREE-CONGESTED AREAS AT MUCH LESS COST...

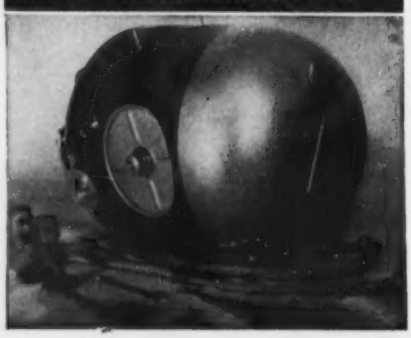
You can save man-hours of wood-cutting and customer complaints when you spin cable through tree-congested areas. What is more, spun cable costs much less to install than pre-assembled cable. Spun cable is so compact that it saves valuable space wherever congestion is a problem.

You save splices and installation labor, because light weight single conductor cables may be spun in lengths three times as long as pre-assembled cables.

You reduce your cable inventories, because 1/c, 2/c and 3/c cables can be spun in the field as required.

Add to these benefits the extra margin of protection against storm damage... and you readily understand why there is a marked trend to cable spinning in the power field.

with NEALE Model "K"



HOW IT WORKS

Drum rotates when its two friction drive wheels respond to pulling of wire. Drum revolves once when 13" of wire is pulled — regardless of condition of strand. Drum carries two spools of wire, each spirals 13" giving support every 6½". Magnesium castings used wherever possible for lightness and strength. Weight: only 56 lbs. Overall length: 18½".

THE WORLD IS SPINNING—TOO!

Cable Spinning Equipment Co.

PHONE 2-7234-5

3100 TOPEKA AVE. TOPEKA, KANSAS

M & M BRIEFS

(*Continued from page* 198)

larged Chicago facilities include sales and engineering divisions, demonstration field, new manufacturing opera- and increased warehouse space. The former branch office and warehouse at San Francisco has been moved to the new expanded sales, engineering and production facilities in Los Angeles.

Chase Brass & Copper Co announced prices on all copper products raised by 0.38 cents per lb. Also quotations on some brass and bronze products have been advanced by 0.43 to 0.55 cents per lb. Adjustments were ascribed to increased costs for labor and some metals, notably zinc.

Radio Corp of America has contracted for installation of a multi-hop microwave radio relay system for Utah Power & Light Co. The system, utilizing the CW-20 equipment, will provide voice, telemetering and supervisory control circuits. It will link the utility's Terminal substation, west of Salt Lake City, with hydroelectric plants at Cutler, Grace, Oneida and Riverdale, Utah.

Pyle-National Co, Chicago, has purchased all patents covering the basic principles of Multi-Vent and Acousti-Vent ceiling panels from Burgess-Manning Co, Libertyville, Ill. Pyle now has exclusive rights to supply this type of flow velocity air distribution equipment in the commercial, industrial and transportation fields.

American Locomotive Co at Dunkirk, N. Y. is reported to have the largest capacity plant for the commercial application of chemical nickel-plating. The company's process, named Alcoplate, is an adaptation of the General American Transportation Corp's Kanigen process. Production facilities handle the process by two continuous-flow methods—closed cycle system for internal and volume coating of similar-sized products, and an immersion process for both internal and external coating and for plating product parts.

McGraw-Electric Co, Elgin, Ill has concluded negotiations to acquire the assets and business of the Lonergan Mfg Co, Albion, Mich. The acquisi-

Here's the Central TRANSFORMER CORP. Story:

. . . why you should specify Central for modern made, longer lasting Transformers that give better service

The best-made transformers will always come from factories with the most up-to-date equipment, geared to quality workmanship. That's why Central transformers are recognized across the country as top quality.

Central's ultra-modern, super-efficient new plant at Pine Bluff provides the very latest machinery and methods. This combined with skilled conscientious workmanship will naturally produce the most dependable, trouble-free transformers. It will always pay you to check with Central for your transformer needs.

Features of Central Distribution Transformers

Externally-clamped primary bushing, galvanized hardware, shank extending into oil. Tin-plated bushing terminals.

Buna N Gaskets, seal assured by rolled edge tank and hand hole. Large oval handhole.

Galvanized cast steel cover clamps. Extra heavy gauge cover hold-down and lifting lugs.

Tap changer operating handle above oil level.

Low voltage Spacer Board.

Combination anchoring and untanking lug. Centering boss in base.

Cold-rolled grain oriented core steel.

Folded layer insulation.

Heavy Gauge Stainless steel name plate with bracket designed for easy cleaning and painting.

Adequate coil ducts.

Filled with inhibited oil under vacuum.

Tank finish is shot blast, primer and two finish coats.

Coils are baked after impregnation with heat reactive polymerizing varnish.

Coil blocking, 15 KVA and above.

Flexible Cable Secondary leads, 25 KVA and above.

Also Available:

Primary Class — from 3 KVA to 15,000 KVA, up to 115 KV primary class.

Pole Types — in sizes from 3 through 167 KVA.

CTC NEMA

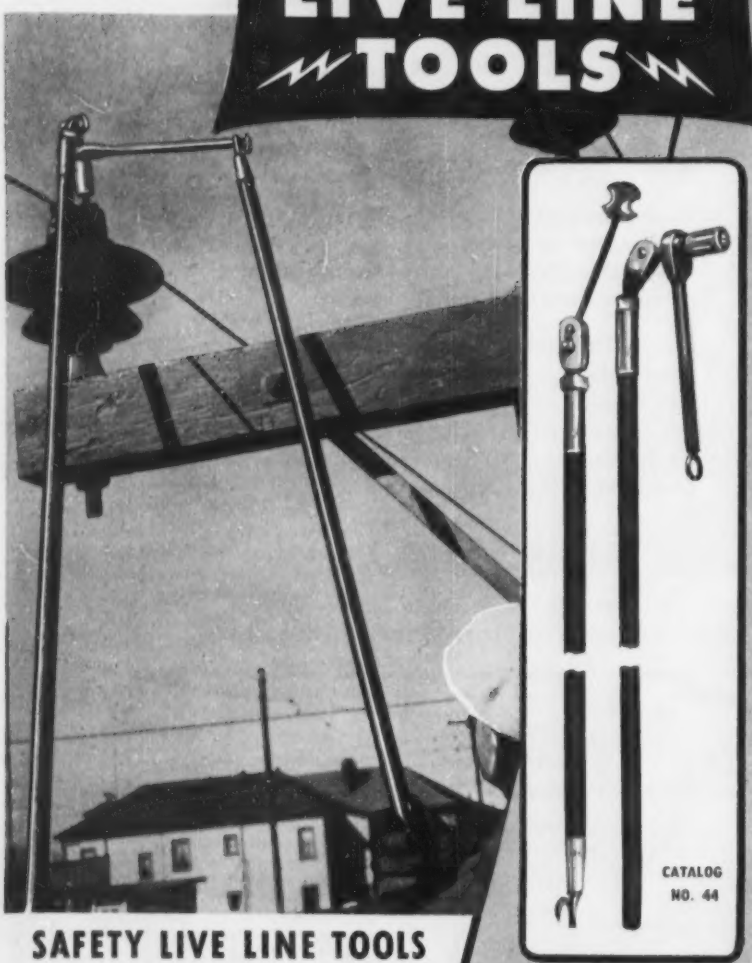
Central TRANSFORMER CORP.

PINE BLUFF, ARKANSAS

Sales Offices in principal cities.

Safer CLAMP TOP INSULATOR changes with less manpower using

SAFETY LIVE LINE TOOLS



SAFETY LIVE LINE TOOLS are designed for work at safe distances from energized lines.

Write for Catalog No. 8 describing clamp top insulator tool and over 100 other live line tools.

SAFE-WAY TOOLS

SAFETY LIVE LINE TOOL CO.

973 - 86TH AVE. • OAKLAND 21, CALIF.

Est. 1926 by Chester C. Coon

tion will be submitted for approval to Lonergan shareholders. Lonergan, makers of air conditioning equipment, space heaters and dehumidifiers, will be operated as an autonomous Division of the McGraw Electric Co.

General Electric Co has completed manufacture of its 100th gas turbine. Seventeen units have been supplied for electric power generation to electric utilities in the United States and three to industrial plants. Others are used for pipeline pumping, powering locomotives, and maintaining oil field pressure.

National Union Electric Corp has asked its stockholders to approve the sale of its television picture tube manufacturing facilities at Hatboro, Pa., to Sylvania Electric Products Inc., the two companies announced.

Motorola Inc, Chicago, will supply equipment for a 160-mile, seven-station microwave system to be installed for Kentucky Utilities Co, Lexington, Ky. The system, scheduled for completion by mid-1955, will utilize 15 channels and will have an ultimate capacity of 24 channels. These channels provide facilities for voice circuits, telemetering and remote control of VHF base station.

Copper diversion of about 32,690 tons was made to industry to relieve the shortage resulting from the recent strike, according to an announcement by the Office of Defense Mobilization.

Aluminum Ltd of Montreal, Canada, shareholders approved increasing the authorized capital to 20 million from 10 million shares.

Vitro Corporation of America has entered the uranium mining field by acquiring interest in 57 uranium claims in the Gas Hills area of Wyoming. Vitro has commenced exploration and drilling in preparation for mining. Other of Vitro's uranium ore interests are in Utah and Ontario. The company is reported to have engineered the original gaseous diffusion plants at Oak Ridge.

Steber Manufacturing Co, Broadview, Ill., announces the formation of Steber Manufacturing Co of California. Manufacturing is underway in a 24,000 sq ft plant at 242 S. Anderson St, Los Angeles 33, Calif.

Merry Xmas!

F. A. Rose
Mgr. of Mfg.

G. M. Ruoff
V. Pres. Gen. Mgr.

D. A. Crytzer
Sales Eng.

T. R. Fry
Chief Eng.

H. L. Elliott
Sales Mgr.

A toast, from all of us, to all of you
A Merry Christmas, filled with great joy and
A New Year of Happiness and
Prosperity.

Quality you can trust

Export Representative:
Philips Export Corp., 100
E. 42nd Street, New York
17, N. Y.

YOUR INDEPENDENT INSULATOR MANUFACTURER

60 years

Porcelain Products, Inc.

PP INC.

PARKERSBURG, WEST VIRGINIA

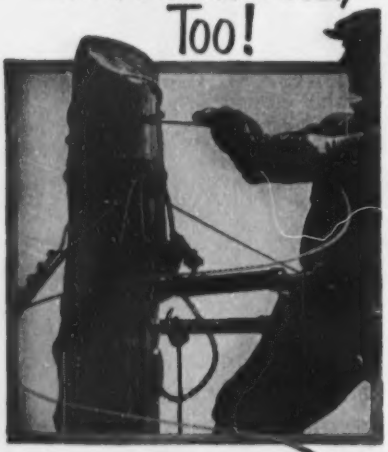
Crapo
GALVANIZED STEEL
STRAND

Strong...
to support pole structures under adverse ice and wind loadings.

Rugged...
to withstand the punishment incurred in construction and service.

Long-Life...
provided by famous *Crapo* Galvanized heavy, ductile, tightly-bonded zinc coatings.

-and Economical, Too!



● Each size and grade of time-proved *Crapo* Steel Strand utilizes the superior tensile strength of steel to the fullest advantage. Next time, *specify Crapo Steel Strand* for guy, messenger and overhead ground wires . . . and *save on maintenance!*

REINFORCE and PROTECT YOUR CONDUCTORS with Preformed ARMOR RODS

Minimize wear and chafing . . . Absorb and dissipate vibration . . . Protect against arcing and flash-overs . . . Increase holding power against slippage . . Lessen possibilities of corrosion . . . *Reduce overall maintenance costs.*

Contact your jobber of *Crapo* Galvanized Products or write direct for further information!

INDIANA
STEEL & WIRE COMPANY
MUNCIE, INDIANA

Meetings Calendar

(*Continued from page* 97)

***AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS**
High Frequency Measurement Conference, Hotel Statler, Washington, D. C., Jan. 17-19; Winter General Meeting, Hotel Statler, New York, Jan. 31-Feb. 4; Utilization of Aluminum Conference, William Penn Hotel, Pittsburgh, March 15-17, 1955.

DOBLE ENGINEERING CONFERENCE
22nd Annual Meeting, Sheraton Plaza Hotel, Boston, Jan. 24-28, 1955.

***CANADIAN ELECTRICAL ASSOCIATION**
Eastern Zone, All Divisions, Sheraton-Brock Hotel, Niagara Falls, Ont., Jan. 25-28; Western Zone, All Divisions, Bessborough Hotel, Saskatoon, Sask., March 7-9, 1955.

PACIFIC COAST ELECTRICAL ASSOCIATION
Business Development Section, Hotel California, Fresno, Calif., Jan. 27-28; Conference on Electronic Integrated Data Processing, Hotel Statler, Los Angeles, Feb. 23-24; Engineering and Operating Section Conference, Hotel Huntington, Pasadena, Calif., March 7-8, 1955.

***MISSOURI VALLEY ELECTRIC ASSOCIATION**
Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 3-4; Engineering Conference, President Hotel, Kansas City, Mo., March 23-25, 1955.

NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION
Annual Meeting, Convention Hall, Atlantic City, N. J., Feb. 14-17, 1955.

***PENNSYLVANIA ELECTRIC ASSOCIATION**
Winter Meeting, Relay Committee, Hotel Roosevelt, Pittsburgh, Feb. 15-16; Winter Meeting, Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, Feb. 17-18; Systems Operation Committee, Abraham Lincoln Hotel, Reading, Pa., Feb. 24-25, 1955.

***NATIONAL ADEQUATE WIRING BUREAU**
11th Annual Conference, La Salle Hotel, Chicago, Feb. 24-25, 1955.

SOUTHERN SAFETY CONFERENCE-EXPOSITION
Jung Hotel, New Orleans, La., Feb. 27-March 1, 1955.

***ROCKY MOUNTAIN ELECTRICAL LEAGUE**
Electric Meter Institute, University of Denver, Denver, Colo., March, 1955.

NORTH CENTRAL ELECTRIC ASSOCIATION
Sales Committee Meeting, Radisson Hotel, Minneapolis, Minn., March 6-9, 1955.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS
Annual Convention, Palmer House, Chicago, March 7-11, 1955.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
Edgewater Beach Hotel, Chicago, March 13-18, 1955.

SOUTHEASTERN ELECTRIC EXCHANGE
Annual Meeting, Boca-Raton Hotel and Club, Boca Raton, Fla., March 21-23, 1955.

OKLAHOMA UTILITIES ASSOCIATION
Annual Convention, Mayo Hotel, Tulsa, Okla., March 24-25, 1955.

CONTROLLERS INSTITUTE OF AMERICA
Southern Conference, Mayo Hotel, Tulsa, Okla., March 25-26.

AMERICAN POWER CONFERENCE
17th Annual Meeting, Sherman Hotel, Chicago, March 30-31, April 1, 1955.

ILLUMINATING ENGINEERING SOCIETY
Southern Regional Conference, Ft. Harrison Hotel, Clearwater, Fla., March 31-April 1, 1955.

*Additions this week.

SALES ASSIGNMENTS

COMPANY STAFFS

Sola Electric Co, Chicago, has appointed Roy R. Marchetti as district sales engineer for its Cleveland office at 1836 Euclid Ave. Marchetti, an electrical engineer, will represent Sola in the Detroit-Cleveland area and throughout the greater part of Ohio and southeastern Michigan. Marchetti, who served most recently in greater New York for Sola, succeeds W. R. Freeman, who has joined the sales staff of the McGraw-Hill Publishing Co.

Bailey Meter Co, Cleveland, has named C. D. Shanks as resident engineer with headquarters in Charleston, W. Va. The Charleston territory includes southern West Virginia and western Virginia. Shanks, who joined the company in 1949, made his headquarters in Cincinnati prior to his present appointment.

American Blower Corp, Dearborn, Mich., has made S. A. Meier manager of its newly opened direct factory branch office at 128 South Central Ave., Phoenix, Ariz. Meier formerly was a sales engineer at the company's Los Angeles office.

Federal Pacific Electric Co, Newark, N. J., has transferred A. E. Johnson from its regional office in Chicago to Minneapolis to supervise its new sales office located at 612 Roanoke Bldg. H. R. Stein, Federal's Minneapolis salesman, will also be located at the new address.

Line Material Co, Milwaukee, has made Allan Steitz branch manager in charge of marketing activities of its newly opened sales and branch office at 317 N. E. Hill St., Oklahoma City. Oklahoma and Texas Panhandle will be serviced by this new office.

REPRESENTATIVES

I-T-E Circuit Breaker Co's Resistor Division has designated Heard Sales Co, at 55 Falmouth Rd., Arlington, Mass., as sales representative for Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, and Maine. The division also assigned Roy M. Price, 12508 Connecticut Ave., Silver Spring, Md., as sales representative to cover the District of Columbia and North Carolina.

Allen-Bradley Co, Milwaukee, has named James L. Howarth Co, Inc, 3021 Seventh Ave., Birmingham, as its sales representative in Alabama. President of the newly formed sales agency is James L. Howarth, formerly general sales manager of the Anderson Brass Works, Birmingham.

Penn-Union Electric Corp, Erie, Pa., has designated Frank C. Clatterbaugh as its sales representative in Nebraska and Iowa. Clatterbaugh, who will start in January to carry Penn-Union fittings in stock in his Omaha warehouse, has specialized since 1948 in sales of electrical products requiring engineering service.

Here's a secondary fuse that waves a RED FLAG to indicate outages . . .

you get low-cost secondary fusing *plus* semaphore indication with the . . .

MATTHEWS CTS* Fuse

Here is the answer to your need for inexpensive protective fusing for secondary systems.

Matthews CTS Fuses give complete protection to secondary systems from service entrance to primary—at a very low cost. They can be used to isolate secondary capacitors, protect transformers in radial secondary systems, protect banked transformers, isolate service faults and for sectionalizing.

Picture at right shows closed view of Matthews CTS Fuse. Overall length including conductor tails is twenty-one inches. Available in a range from 5 to 200 amp. rating.

Red Flag Indicates Outage. The red plastic indicator on the Matthews CTS fits tight against the fuse cartridge until the fuse element ruptures. The flag is then released and instantly springs away from the cartridge. Linemen can easily spot this semaphore signal from the ground.

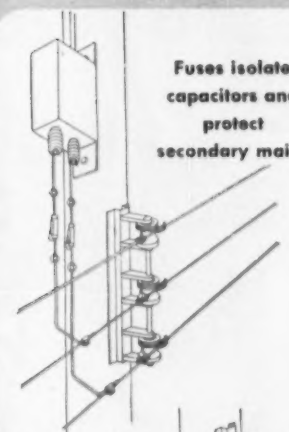
Stays Intact After Operation. Matthews Secondary Fuses do not fall apart and hang down after they blow and therefore cannot short-circuit other lines.

Can Be Co-ordinated—Curves Available. For the greatest possible protection on the entire system, Matthews CTS Fuses can be co-ordinated with primary fuses. Curves showing minimum melting and maximum total clearing time current characteristics are available on request.

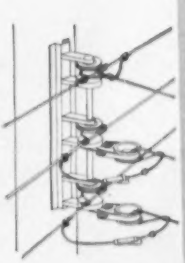
*Cartridge Type Semaphore

Send for complete information and performance curves today

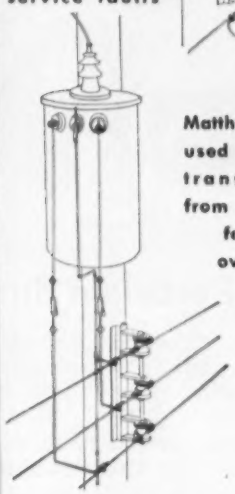
HOW TO PROTECT SECONDARY SYSTEMS WITH MATTHEWS CTS FUSES



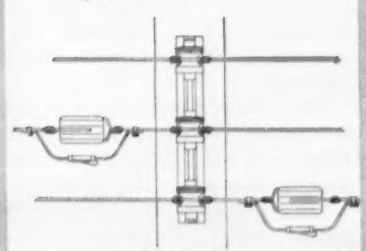
Fuses isolate capacitors and protect secondary mains



Matthews Fuses used on service entrance leads to protect the system from service faults



Matthews Fuses used to protect transformers from secondary faults or overloads

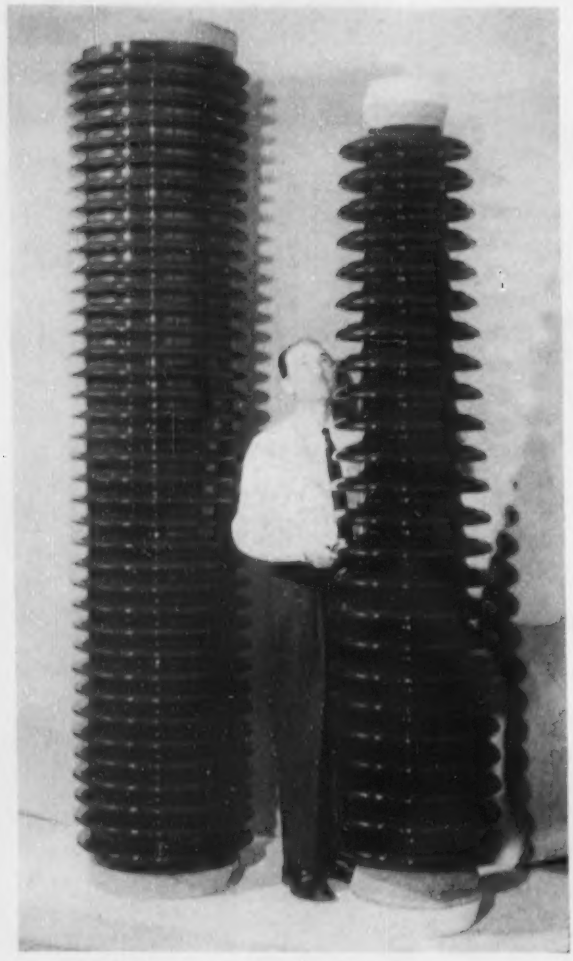


Application of Type CTS Secondary Fuse on Secondary Network

A·B·CHANCE CO.

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

CFSA-24



Huge Porcelain Bushings

Two long high-voltage electrical porcelain insulators are available in one-piece homogeneous structures. These reportedly are the largest pieces of porcelain ever produced.

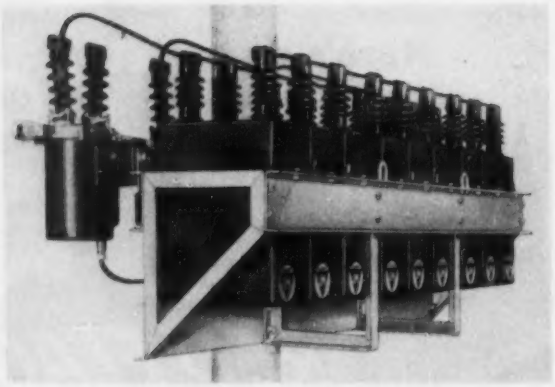
The bushing type insulator on the right is for a 230-kv interrupter unit of a 230-kv oil blast circuit breaker. It is 112 in. long, 24 in. OD, weighs 1,325 lb, and has 246 in. of leakage distance. The ends are ground for gasketing and will be supplied with metal flanges cemented for mounting.

The bushing type insulator on the right is for a 230-kv pothead for pressure cable. It is 101.25 in. long, weighs 837 lb, and will be supplied with ends and conical sections near the ends ground for gasketing.

The size and slender proportions, and the fact that the pothead bushing is designed to withstand a pressure of 800 psi, combine to make this a difficult piece to produce. Every porcelain is proof tested to 500 psi and operates at 250 psi. Soundness, security and permanence have been established by a series of exhaustive tests.

The porcelains are in quantity production.

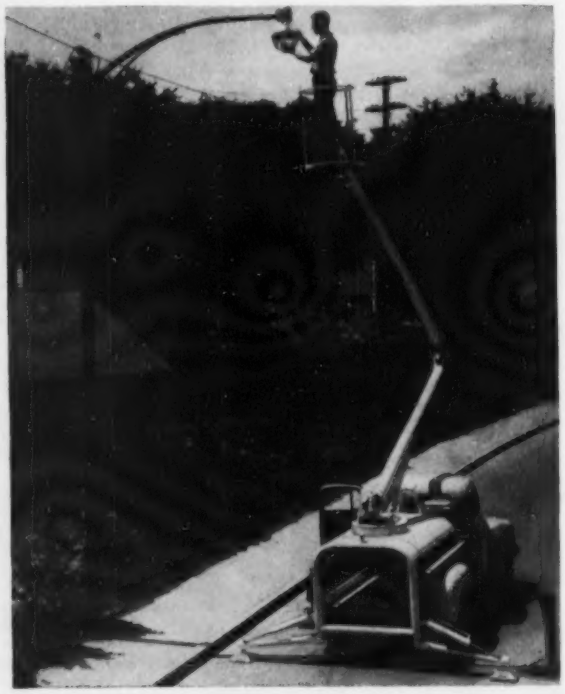
Lapp Insulator Co, Inc, Le Roy, N. Y.



Single-Row Capacitor Racks

Single-row capacitor racks are designed for direct pole mounting. They conserve pole space, reduce bending stress on poles, and facilitate inspection and maintenance. Single-row racks are available as complete assemblies, switched or unswitched, and ready for installation on 2,400 to 13,800 v systems. Bank sizes may be 225 or 300 kvar.

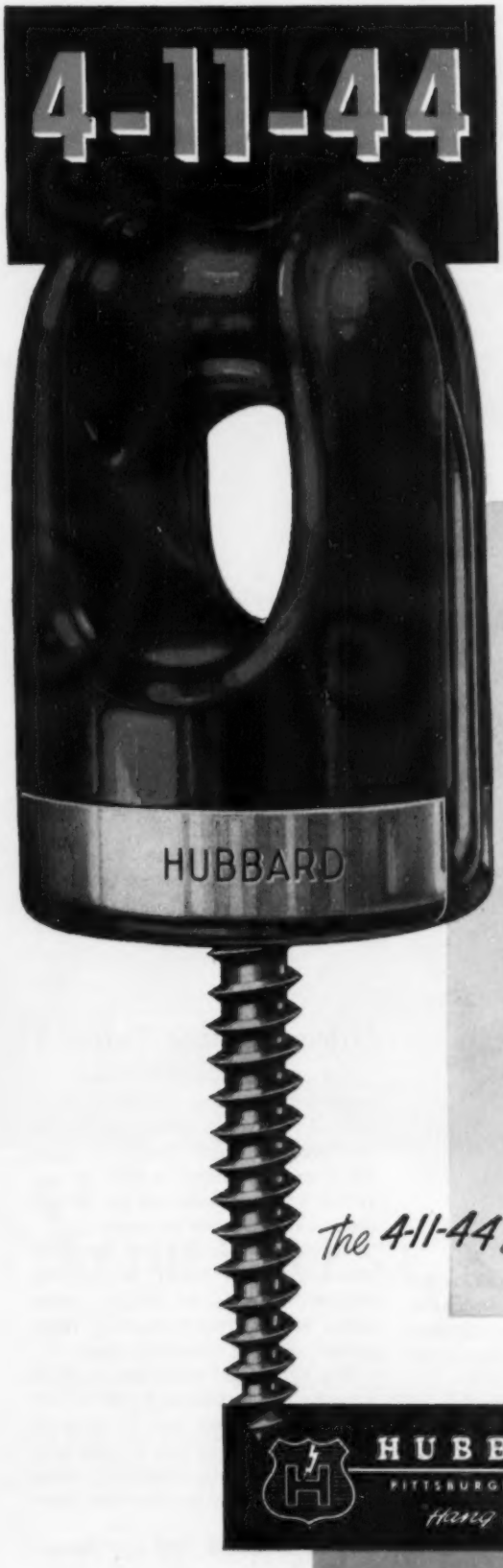
Line Material Co, 700 W. Michigan St, Milwaukee 1, Wis.



Personnel Tower

Series of Hi-Ranger extensible personnel towers place a worker at maximum platform heights of 32 ft (Series 3), or 40 ft (Series 4). Units are flexible in mounting. Series

(*Continued on page* 208)



The Most Famous Stock Number in Pole Line Hardware

The Hubbard "4-11-44" is known by its stock number from coast to coast. It's the most famous and most popular wireholder ever made.

Its popularity is no accident. It is designed on the principle, established by Hubbard 38 years ago, that for proper strength a wireholder must employ the metal parts for tensile strength, the porcelain parts for compression strength only.

The heavy, strong Copperweld bail in the 4-11-44 resists corrosion and carries the load with undiminished strength for the entire life of the wireholder.

The porcelain is designed with smooth, large-radius contours that safeguard conductors against abrasion, and a wire hole measuring 7/8 by 1-inch, sufficiently large for any service entrance wires or cables.

The 4-11-44 deserves its excellent reputation

HUBBARD AND COMPANY

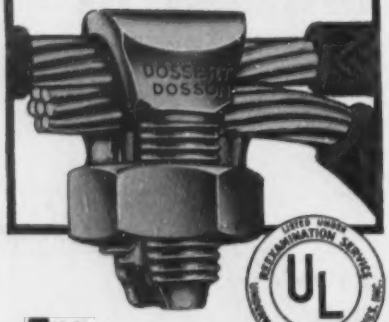
PITTSBURGH • CHICAGO • OAKLAND CALIFORNIA

"Hang the Load on Hubbard Hardware!"

NEW!

DOSSON "F"

SPLIT BOLT CONNECTOR



For:

taps, dead-ends, service entrances, motor leads, junction boxes, ground wire-to-neutral connections

Fabricated from high strength alloys, all component parts of the new Dosson "F" Connector are cold formed, insuring consistent uniformity and high quality. Can be used economically over and over again!

Why It's Your Best Bet:

- high clamping pressure insures tight contact
- maximum tightening force: high translation of tightening torque
- connector alloys possess greater physical properties than average steels
- longer bearing pressure bars avoid conductor crushing, load concentration
- smooth edges can't cut lineman's gloves, nick conductors
- withstands high overload, vibration, corrosion

50 YEARS OF TECHNICAL KNOW-HOW

FREE SAMPLE upon request. Write today!

IN STOCK FOR IMMEDIATE DELIVERY

DOSSERT REPRESENTATIVES IN PRINCIPAL CITIES

DOSSERT MFG. CORP.

249 HURON STREET, BROOKLYN 22, N. Y.

SINCE 1904

New Equipment

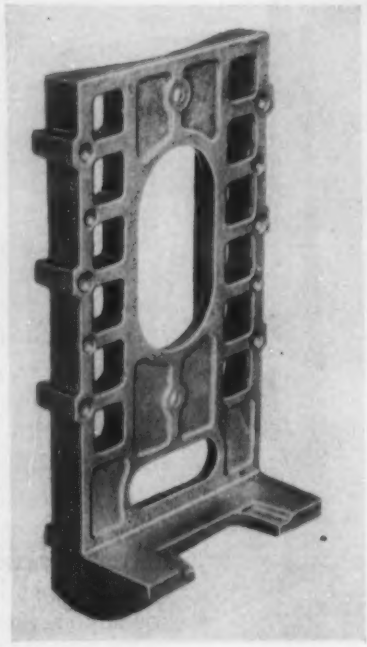
(*Continued from page* 206)

3 can be mounted on a ¾ ton or larger pickup or utility truck. Series 4 can be mounted on 1½ ton trucks.

A single-handed "3-D" control facilities movement of operator's platform in 3 dimensions simultaneously. Booms are seamless steel tubing. Power is furnished by hydraulic system powered by vehicle's engine.

Retracable hydraulic outriggers provide stability. Platform weight capacity is 250 lb for Series 3, 300 lb for Series 4. Insulated upper booms and platforms can be supplied. Literature is available.

Mobile Aerial Towers, Inc, 1405 North Clinton St, Fort Wayne, Ind.



Crossarm Gain

Crossarm gain, No. PX187, is primarily for use on H-frame structures. It provides support for the crossarm and eliminates need for gaining the pole.

As the gain takes the shear load off the bolt, bolt binding and bolt hole slottings are virtually eliminated. Heel pad, teeth, and ribs give vertical and transverse stability. The PX187 will accommodate arms from 7 to 10 inches from top to bottom.

Malleable Iron Fttings Co, Branford, Conn.

Lever Hoist

Ratchet lever hoist built to military specifications is now available for commercial sale. This Super Power hoist has 2½-ton capacity with single chain. Efficiency is 75%. Grease sealed mechanism keeps dirt and grit out—it can be refilled by removing a plug. Complete unit with 6-ft double-chain lift weighs less than 60 lb.

Coffing Hoist Co, Danville, Ill.

Nylon-Neoprene Tarps

Lightweight tarpaulins made of nylon and neoprene synthetic rubber are said to have a long life expectancy. The medium-weight Fairprene tarps are four to six times as hard to tear as No. 8 treated duck, and can be vulcanize-patched when necessary.

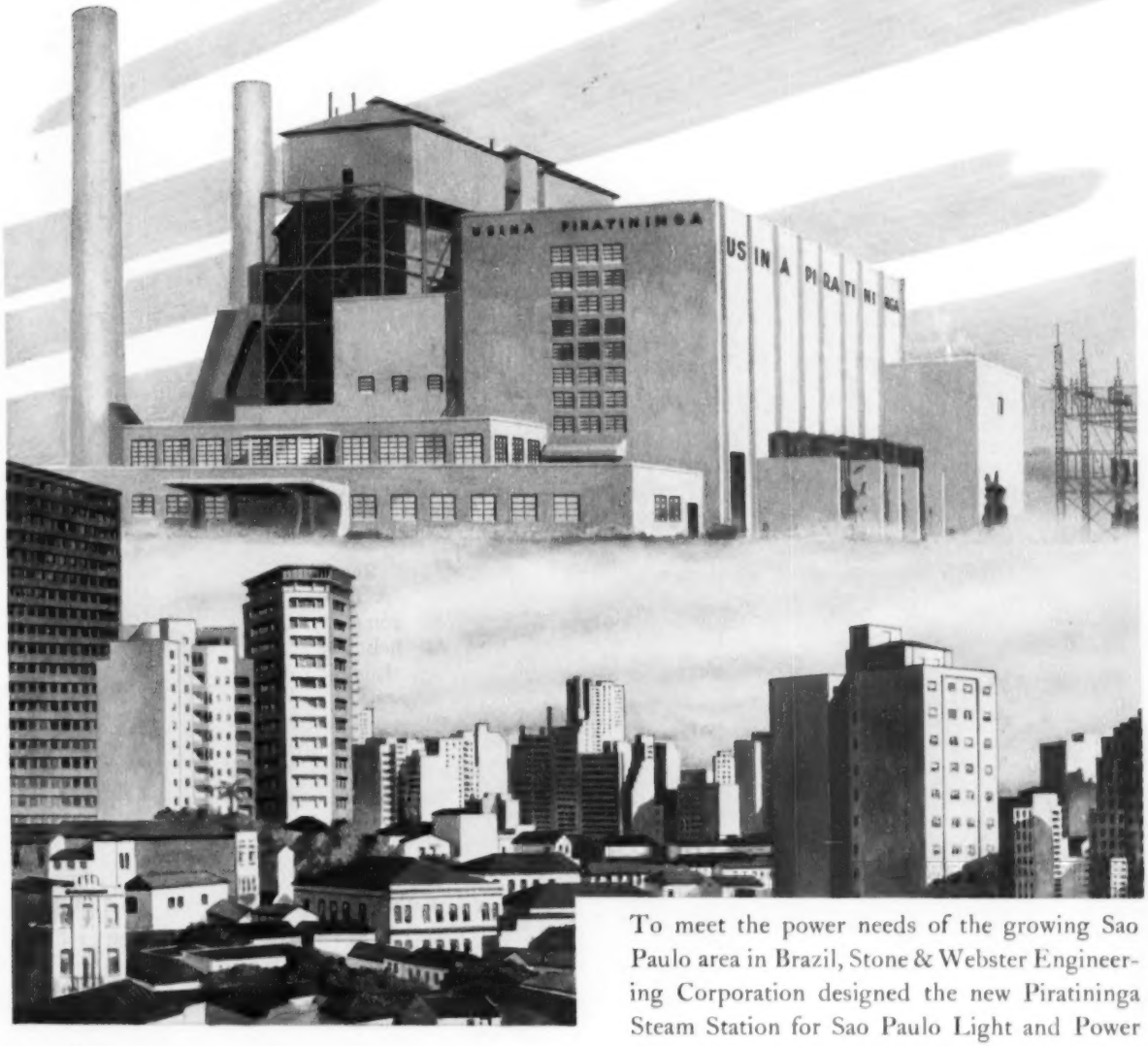
They do not shrink, grow heavy by absorbing rain, stiffen in freezing weather, nor rot or mildew when stored wet. Furthermore, they resist greases, oils and climatic extremes.

The lightweight grade weighs 9 oz a yard. This compares to 26 oz for No. 8 duck. Tests now in progress already have proved that the new tarp material has a life expectancy twice of No. 8 duck, and may be three times greater.

Du Pont Co, Room 7145-D, Wilmington 98, Del.

(*More New Equipment on page* 211)

Piratininga Steam Station houses two 100,000 kilowatt capability turbine generators, each with its own boiler, these being the largest generator units ever shipped to South America.



ACHIEVEMENT IN BRAZIL . . .

To meet the power needs of the growing Sao Paulo area in Brazil, Stone & Webster Engineering Corporation designed the new Piratininga Steam Station for Sao Paulo Light and Power Company, Limited, an operating subsidiary of the Canadian corporation, Brazilian Traction, Light & Power Company, Limited.

Construction for the first unit, now in operation, was completed in a record time of 26 months by Stone & Webster Construction Company.

All available materials were purchased in Brazil, and the field forces, totaling over 1800 at the peak of construction, were recruited locally.

Write or call us for detailed information as to how our engineering, design, construction, report and appraisal services may be of assistance to you.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.

New York Boston Chicago Pittsburgh Houston San Francisco Los Angeles Seattle Toronto

"UP IN THE AIR"

on plant expansion

when existing

circuits are

loaded

ROCKBESTOS AVC®

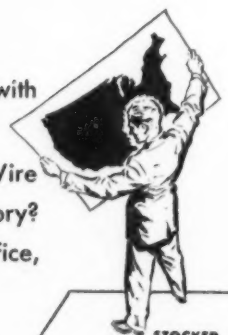
(N.E.C. TYPE AVA)

WIRE AND CABLE is your solution

How to get added electrical capacity to take care of needed additional plant facilities has many a production man "up in the air".

A good solution for increasing your current capacity 30 to 50% is to replace your present wire and cable with Rockbestos A.V.C.

Why not have a Rockbestos Wire Specialist give you the complete story? Phone or write the nearest branch office, today.



STOCKED COAST TO COAST

Standard Rockbestos A.V.C. (N.E.C. types AVA, AVB, etc.) are available from stock for immediate shipment. Call or write nearest branch office.

ROCKBESTOS PRODUCTS CORP.

NEW HAVEN 4, CONNECTICUT

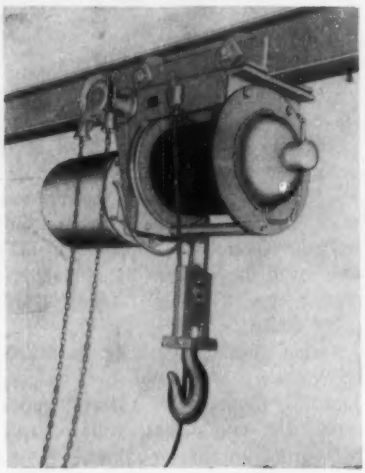
NEW YORK • CLEVELAND • DETROIT • CHICAGO
PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA • SEATTLE

Insulating Fabric

A silicone rubber-coated glass fabric is recommended by the manufacturer for use as electrical insulation, gasketing, and sensitive diaphragms. The fabric weighs only 4.5 oz per sq yd and has a dielectric strength of 1,100 to 1,400 v per mil of thickness. Called Cohrlastic 2804, the fabric works properly through a temperature range of −70 to 500F, and is flexible and rubbery.

The base glass fabric is a new 0.001 in. thick cloth coated to minimum thicknesses. It is also available coated with silicone rubber to thicknesses of 0.007 to 0.010 in. to increase air impermeability.

Connecticut Hard Rubber Co, 407 East St., New Haven, Conn.



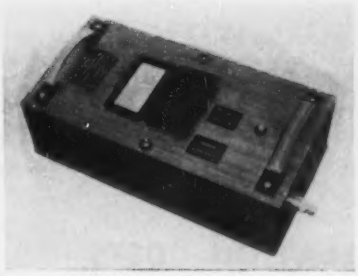
Electric Hoists

Series of 8 and 10 ton capacity electric hoists require about 37 in. of headroom. Lift height is 15 ft and up. Choice of four mountings are: plain trolley, hand-geared trolley, motor driven trolley, and lug mounting on a monorail.

Mechanical load brake is stated to give safe, precision control of loads. Brake is constructed integrally with hoist motor and gear reduction. It automatically engages two cone-shaped, metal friction surfaces when 3-phase power is removed from the motor circuit.

Motors are squirrel-cage induction type. The 10-ton hoist with hand-geared trolley mounting is illustrated.

R. G. LeTourneau, Inc, Longview, Texas



Insulation Tester

Rectifier-operated Megger insulation tester (8640) has a range up to 200,000 megohms at 10,000 v. Another model (8639) has a range up to 100,000 megohms at 5,000 v dc and has 1,000 and 2,500 v intermediate ranges. Input is 115 v, 60 cps. The d-c power supplies use selenium rectifiers and a constant-voltage transformer.

The moving systems of the testers have vibrators to reduce effect of pivot-to-jewel friction. Automatic discharge switches short the line and earth terminals when power is turned off. Weight of each model is about 50 lb. Ask for Bulletin 21-20.

James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.

450-Mc Radio

Greater r-f selectivity and increased reliability are claimed for mobile radio receiver operating in the 450-470 Mc range. Multiple-cavity preselector of compact design gives skirted selectivity and protects against uhf television interference.

The companion transmitter also uses band-pass cavities to provide attenuation of harmonics and subharmonics.

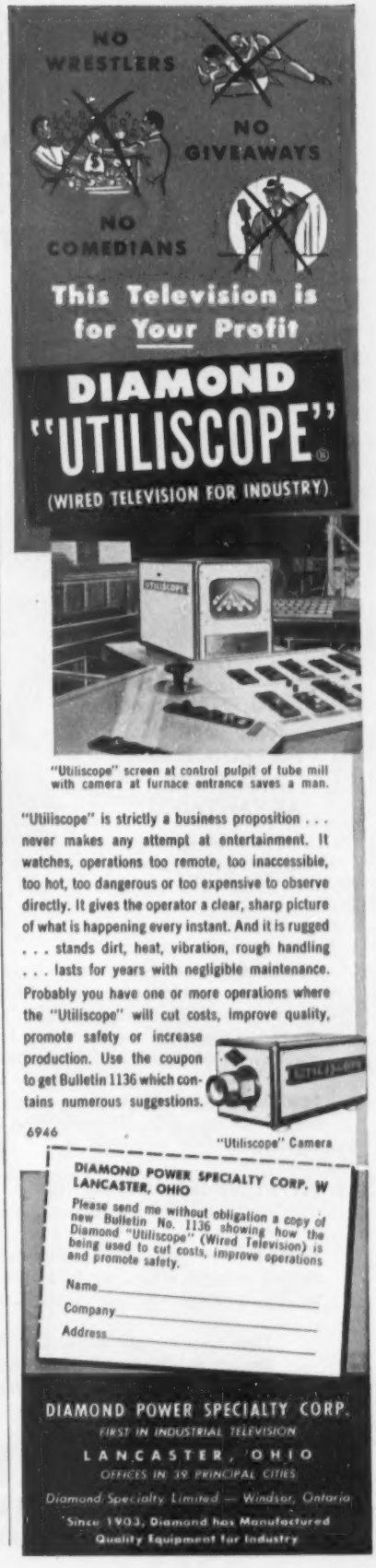
Motorola Communications & Electronics, Inc, 4501 W. Augusta Blvd, Chicago 51, Ill.

Car Generator

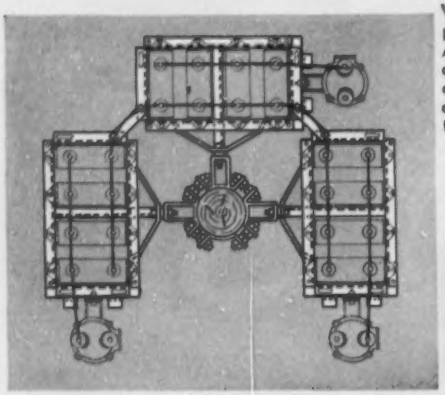
High-output "2-Way Radio" generator has a maximum output of 50 amp. Used with a temperature-compensated regulator unit, cold weather maximum output is in excess of 60 amp. Generators are available with two sizes of pully: one for city and one for highway operation.

Electric Auto-Lite Co, Toledo 1, Ohio

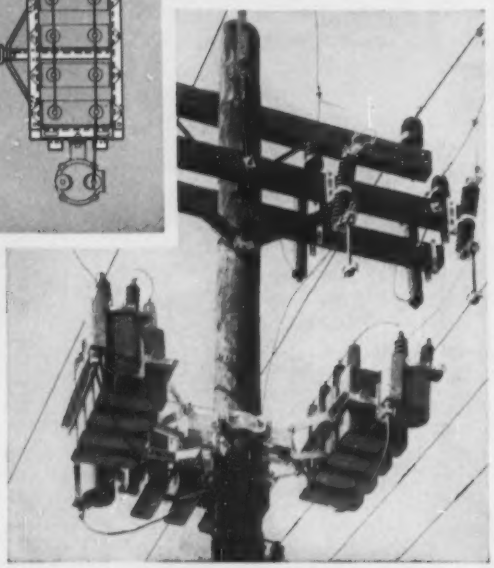
(*More New Equipment on next page*)


NO WRESTLERS
NO GIVEAWAYS
NO COMEDIANS
This Television is for Your Profit
DIAMOND "UTILISCOPE"®
(WIRED TELEVISION FOR INDUSTRY)
"Utiliscope" screen at control pulpit of tube mill with camera at furnace entrance saves a man.
"Utiliscope" is strictly a business proposition . . . never makes any attempt at entertainment. It watches, operations too remote, too inaccessible, too hot, too dangerous or too expensive to observe directly. It gives the operator a clear, sharp picture of what is happening every instant. And it is rugged . . . stands dirt, heat, vibration, rough handling . . . lasts for years with negligible maintenance.
Probably you have one or more operations where the "Utiliscope" will cut costs, improve quality, promote safety or increase production. Use the coupon to get Bulletin 1136 which contains numerous suggestions.
"Utiliscope" Camera
6946
DIAMOND POWER SPECIALTY CORP. W
LANCASTER, OHIO
Please send me without obligation a copy of new Bulletin No. 1136 showing how the Diamond "Utiliscope" (Wired Television) is being used to cut costs, improve operations and promote safety.
Name
Company
Address
DIAMOND POWER SPECIALTY CORP.
FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO
OFFICES IN 39 PRINCIPAL CITIES
Diamond Specialty Limited — Windsor, Ontario
Since 1903, Diamond has Manufactured Quality Equipment for Industry

HANGING CAPACITORS WITH
UNIVERSAL CAPACITOR RACKS
SAVES UP TO 40%
INSTALLATION COSTS



With Universal Racks you simplify hanging capacitors . . . Actual labor time greatly reduced by ground assembly and eliminates gaining the pole—drilling holes — excessive material handling.



NO OTHER HANGING METHOD HAS ALL THESE ADVANTAGES

LOWER COST — per overall installation. Actual records prove saving up to 40% over conventional methods.

NO MAINTENANCE — All parts hot dipped galvanized to most rigid A.S.T.M. specifications. Capacitor racks will outlast pole.

LESS POLE SPACE REQUIRED — Allows multiple units to be installed on one pole. All points on top of—alongside—and under capacitors easily accessible.

BETTER WEIGHT DISTRIBUTION — Prevents buckling and/or drifting of the pole. Stronger installations.

VERSATILE — Will mount either standard distribution size capacitor groups. Universal Pole Brackets will fit any pole from 6 to 10½ inches or 9½ to 14 inches in diameter.

There are other advantages to be found in using Universal Pole Brackets and Universal Capacitor Racks. Write now for free catalogue or request us to send a representative to see you. No obligation, of course.

UNIVERSAL
POLE BRACKET CORP.
P. O. BOX 1118—HOUSTON 1, TEXAS

Control Cable

Flexible control cables have from 5 to 24 conductors, sizes 18 through 10 AWG. Conductors in this Bronco 60 Certified Control Cable are annealed, electrolytic copper. Insulation over the conductors is heat-resistant Type RH rubber. Singles are color coded.

Outer protecting jacket contains 60% new Neoprene by weight. Jacket is branded every 2 ft with name, type, size, conductors, voltage, and flameproof approval number.

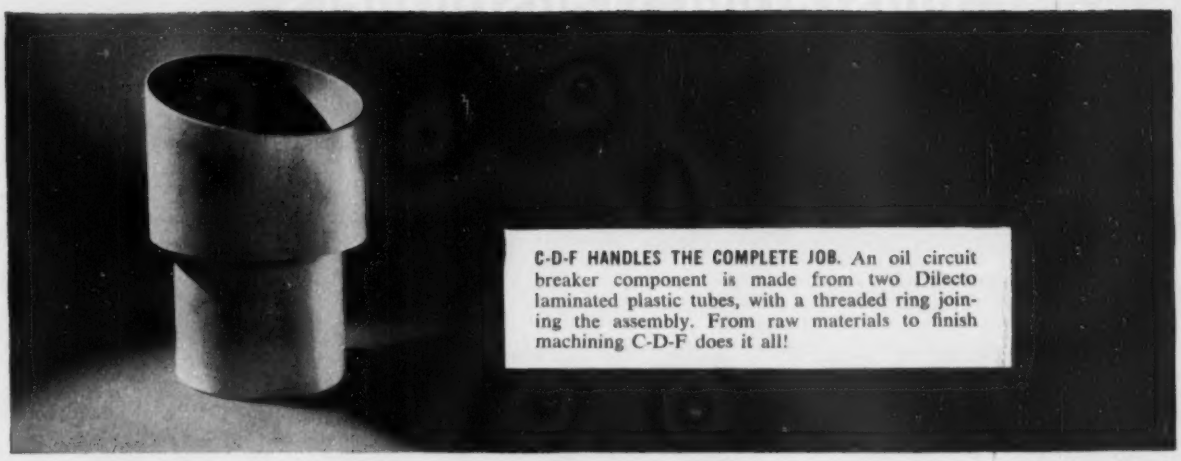
Western Insulated Wire Co, Los Angeles, Calif.

Pressure Logger

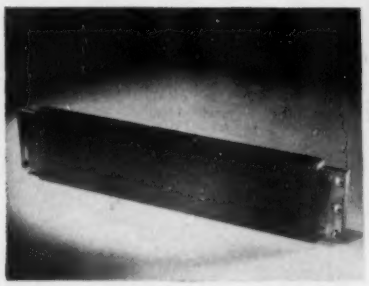
An automatic multiple pressure logger samples up to 200 pressures with accuracy of one part in 2,000 or more, recording them in 60 sec as a typewritten column log and as punched tape. Designed to cut initial instrumentation costs, the Automatic Press-I-Cell Logger's output may be fed directly to computers or card-punch equipment without intermediate tape storage of data. The device speeds processing of test data in experimental work and cuts chances of human error.

Fischer & Porter Co, 269 Jacksonville Rd, Hatboro, Pa.

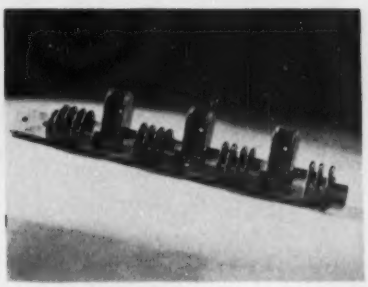
(*More New Equipment on page* 216)



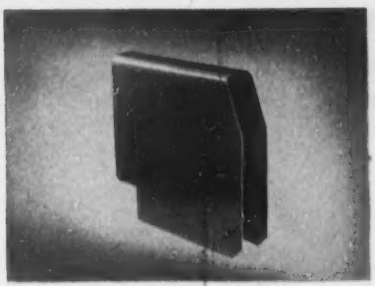
C-D-F HANDLES THE COMPLETE JOB. An oil circuit breaker component is made from two Dilecto laminated plastic tubes, with a threaded ring joining the assembly. From raw materials to finish machining C-D-F does it all!



C-D-F KNOWS HOW TO MACHINE PLASTICS. A bus bar gets a covering of molded Dilecto over copper supplied by the customer. The plastic ends are skillfully trimmed on a smooth saw.

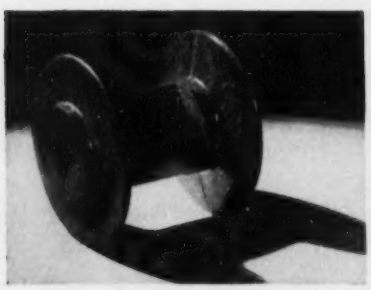


C-D-F MOLDS MANY SPECIALTIES. This shaft insulator for a circuit breaker is molded from C-D-F's cloth-based industrial thermosetting plastic, Celoron. Note complexity of mold, clean detailing.



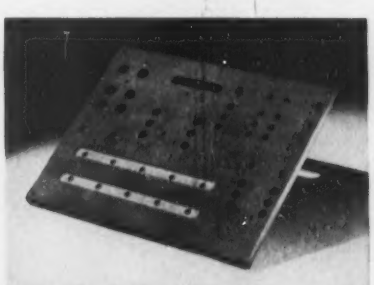
C-D-F USES MODERN METHODS. Large quantities of arc chute barriers are made from paper-based Dilecto. Operations include pressing, cutting, post-forming and trimming.

DEPENDABLE equipment RELIES on C-D-F INSULATION!



C-D-F OFFERS UNIQUE MATERIALS. This contact shaft for an air circuit breaker is another example of molded C-D-F Celoron used in switchgear because of its high impact strength.

C-D-F IS A SKILLFUL ASSEMBLER. Made from Grade C rolled Dilecto tubing, these pots are turned, bored, slotted. Then a macerated plastic end is inserted and arc resistant varnish finish applied.



C-D-F UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS. Precisely machined to close tolerances, Dilecto panel boards guarantee dependable insulation, help designers save space.

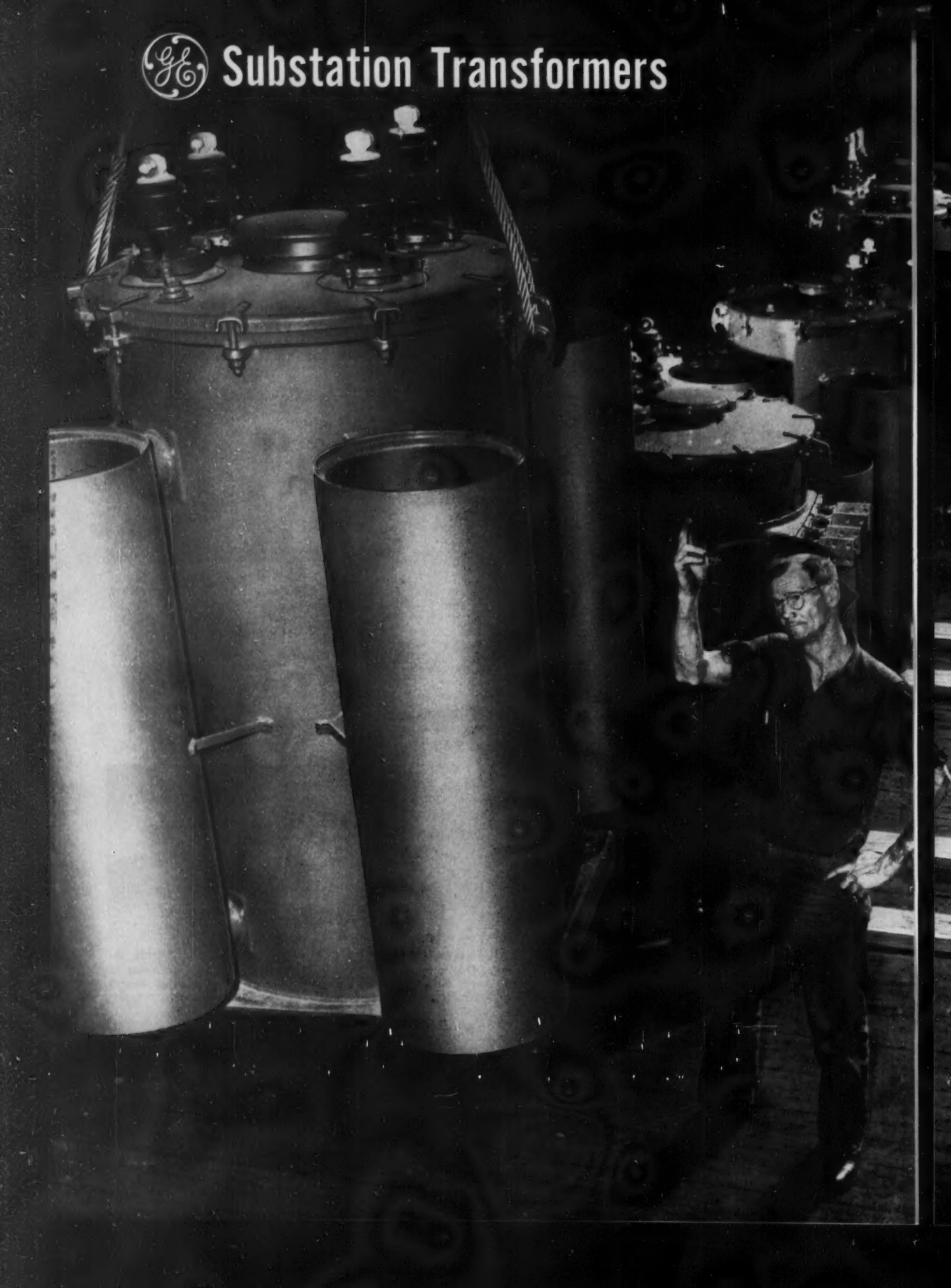
See our catalog in Sweet's Design File for basic product data and sales offices. Write for detailed information, or send us your print for quotation.

CDF *Continental-Diamond Fibre*

CONTINENTAL-DIAMOND FIBRE COMPANY

NEWARK 15, DELAWARE

Substation Transformers



Here comes the new look in substation transformers

G-E Chimney Radiators Cut Height 30%, Weight 10%

The new General Electric substation transformer, developed after extensive research on methods of cooling, makes possible important savings in installation and maintenance costs and, in addition, offers increased reliability.

Installation Costs Cut—For example, since height is reduced about 30%, you can install a new 250-kva unit where you now have a 100-kva unit—headroom requirements for both units are the same. This enables you to make sizeable savings because, in most cases, you can install higher rated transformers to meet load growth without enlarging your present installation facilities.

The average 10 per-cent reduction in weight and lowered center of gravity make for easier handling, further simplifying installation.

Maintenance Costs Also Cut—Repainting is easier than with conventional tanks because you paint a few large, smooth surfaces instead of many small, round tubes, complexly arranged.

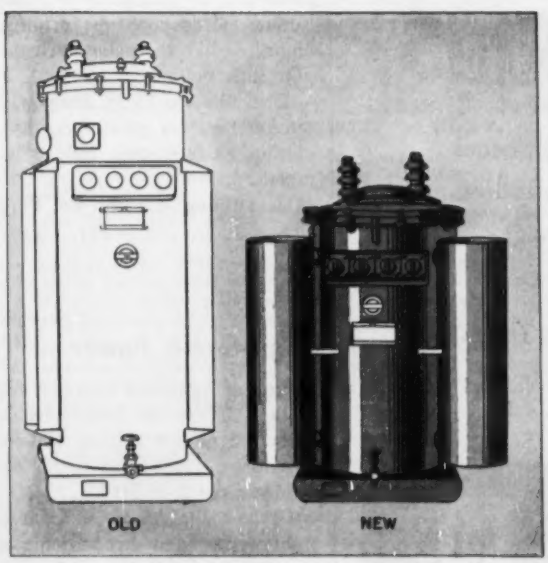
Reliability Increased—Offering the same excellent electrical characteristics as the previous design, chimney-radiator substation transformers are stronger and offer less chance for oil or Pyranol* leaks than conventional units because there are fewer openings into the transformer tank.

Availability—G-E chimney-type substation transformers are currently available in ratings of 250, 333, and 500 kva, in voltages up to 69,000 volts. For further information, write Section 431-14, General Electric Company, Schenectady 5, N. Y.

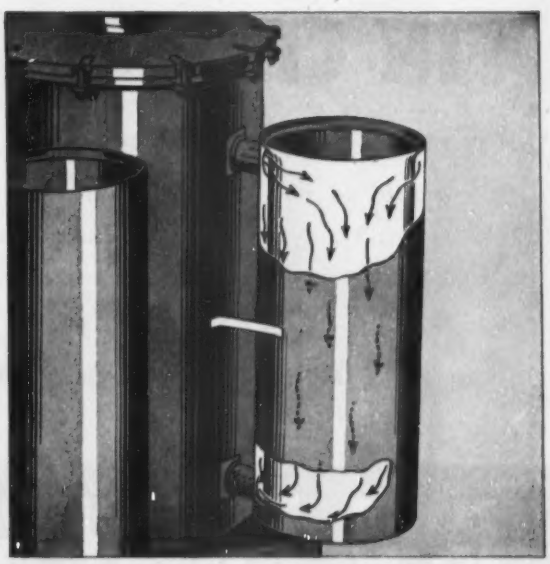
*Reg. Trademark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC



CUTS HEADROOM REQUIRED BY ABOUT 30%.—Where clearance is important the new G-E design is a big help because it reduces transformer height as much as 2½ feet.



MORE EFFICIENT COOLING.—The new G-E transformer has four simple, efficient cooling "chimneys." With fewer tank openings, there is little possibility of oil leaks.

Dear Santa:
Make our Christmas Tree
Western Red Cedar, like
the HALEY poles!

Haley's PENTAchlorophenol TREATED

CEDAR POLES
AND
FIR CROSS ARMS

Light in weight and clean. PENTAchlorophenol treated in our modern plant for protection against decay, moisture and insect damage.

TWO Strategically Located Yards
MINNEAPOLIS, MINNESOTA
FINDLAY, OHIO

R. G. HALEY & CO.
SPITZER BLDG. TOLEDO 4, OHIO

Digital Voltmeter

Digital voltmeter, Model 519, is a self-balancing, 5-place digital potentiometer for measuring dc voltages from 00.001 to 999.99 volts. Error is below 0.01% or 00.001 volts, whichever is greater. Decimal position and polarity are indicated automatically. Input resistance is 1,000 megohm below 100 v; 11 megohm above.

Accessories are available for transmitting the reading to remote readouts, as well as printing, typing, or punching permanent records. An internal 1.018 v Weston standard cell can be switched in for calibration. Design of the voltmeter uses etched circuitry. Weight is 49 lb; input is 115 v, 60 cps.

Non-Linear Systems, Inc, Box 728, Del Mar, Calif.

Drilling Machine

Machine drill will bore 2-10 in. dia holes through reinforced concrete, terrazzo tile, or granite at 3 inches per minute. This core-type drilling machine is said to make a clean hole with little noise.

Drill bits are 15 in. long, with extension bars for greater depths. The cutting surface uses industrial diamonds.

Mole Drilling Machine Co, Portland, Ore.

High-Cycle Power

Line of frequency changers for operating fluorescent lamps consist of induction motors driving 400-cps alternators. Units are available in ratings from 2 to 50 kw.

Greater brilliance and freedom from flicker and stroboscopic effect are claimed by operating fluorescents from 400-cps power. Tests by Bogue indicate 30-40% improvement in bril-

(*Continued on page* 220)

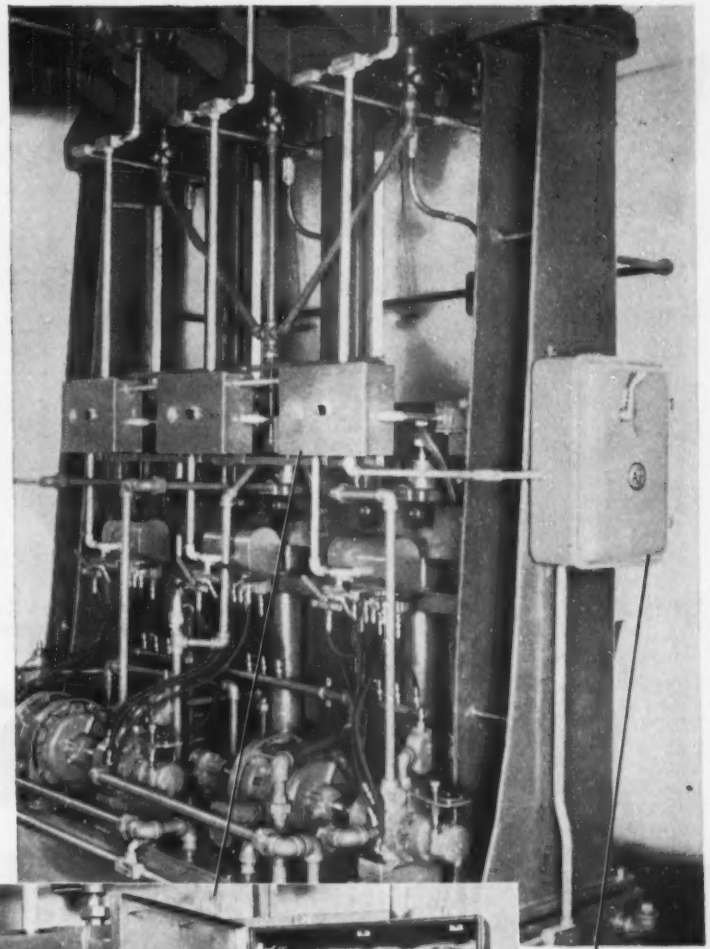
Only ARROW-HART

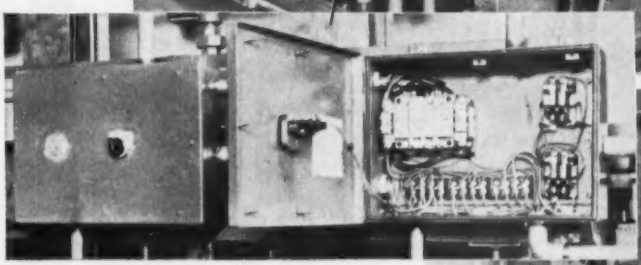
Advanced Design

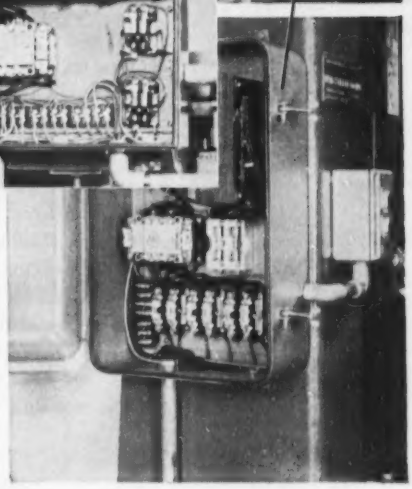
MOTOR CONTROLS

could meet ALL THREE REQUIREMENTS

1. **EXTREME DEPENDABILITY . . .** for 24-hour-day, 7-day-week operation.
2. **TOP PERFORMANCE . . .** for a very sensitive relay requirement.
3. **MUCH SMALLER SIZE . . .** to save vital space and weight.







MULTI SPINDLE VERTICAL BARREL REAMER

manufactured by

THE W. M. STEELE COMPANY

Installation includes: 1 Size 1 Starter, 3 Size O Starters. Overload Protective and Magnetic Relays, Push Button Stations, Selector Switches, and other Auxiliary Devices.

Ultra modern, high-output machines demand new standards in motor control performance. That's why Arrow-Hart Type "RA" (Right Angle) Starters and other A-H Controls . . . offering more advanced design features and more important operating advantages than any others available anywhere . . . were the ONLY POSSIBLE CHOICE for this new machine designed to ream .30 and .50 calibre rifle barrels.

The machine is set up for either push or pull reaming with either manual operation or fully automatic cycling. The main panel controls two motors; each of the three spindle panels controls a set of four spindles. Smaller, more compact A-H Controls keep panel size to a minimum . . . and still leave ample room for fast, easy inspection and maintenance.

If your machine designs or production planning demand higher output, added operational efficiency or greater compactness . . . or a combination of all three . . . plan on Arrow-Hart Electrical Controls. And Arrow-Hart Engineers will be glad to help with your tough control problems; write for complete information.

ARROW-HART

INDUSTRIAL CONTROL DIVISION

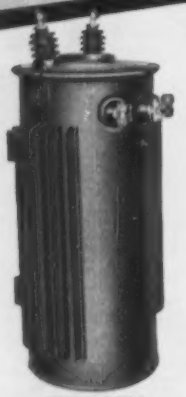
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY

103 HAWTHORN ST., HARTFORD 6, CONN.

Offices, Sales Engineers and Warehouses: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco. Canada: Arrow-Hart & Hegeman (Canada) Ltd., Mt. Dennis, Toronto. England: Arrow Electric Switches, Ltd., Ealing, London W5.

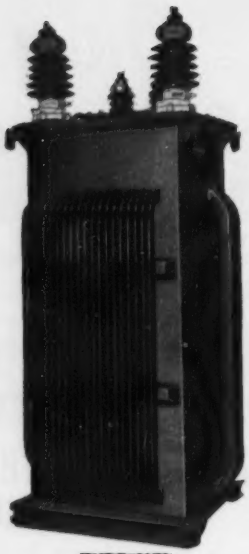
Quality MOTOR CONTROLS • WIRING DEVICES • ENCLOSED SWITCHES • APPLIANCE SWITCHES

Wagner®
TRANSFORMERS
...the choice of leaders in industry



TYPE HEK
Single-phase 50 kva, 12000 to 120/420 volt transformer shown.

TYPE HEB
Single-phase 100 kva, 2400/4160Y to 120/240 volt transformer shown.



TYPE HEL
Single-phase 333 kva, 34400 to 7200 volt transformer shown.

choose Wagner

they meet all NEW EEI-NEMA Standards

The Wagner line of Distribution Transformers will meet your requirements no matter how varied they may be. The line includes *every rating and design* listed in the E. E. I.—NEMA *Fifth Report.*

When you choose WAGNER, you get all the standardized electrical and mechanical features that assure quick, easy installation and greater convenience in handling and maintenance. You get full Wagner Quality—the kind of quality that pays dividends in years of extra service. You get the benefit of improved design, better performance and longer transformer life.

You get quick delivery, too. Wagner's expansion program has provided a new plant, devoted exclusively to the manufacture of transformers, to help meet the growing demand for Wagner Transformers. And—in addition, Wagner has a nationwide organization to provide fast, convenient service, with branches in 32 principal cities.

Get in touch with your nearby Wagner branch today. Write for your copy of Bulletin TU-180. It gives complete information on Wagner Distribution Transformers.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Avenue • St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

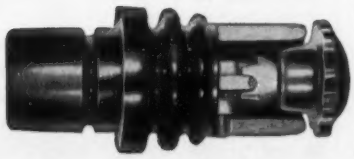
TYPE HPK
Three-phase 225 kva, 7200 to 240 x 480 volt transformer shown.

TYPE HPB (Vertical)
Three-phase 112.5 kva, 2400 to 208Y/120 volt transformer shown.

TYPE HPB
Three-phase 75 kva, 2400 to 240 x 480 volt transformer shown.

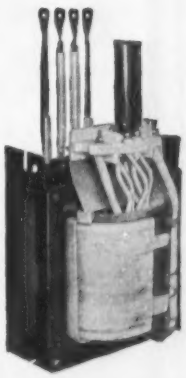
Distribution Transformers

...and offer these EXTRA features, too!

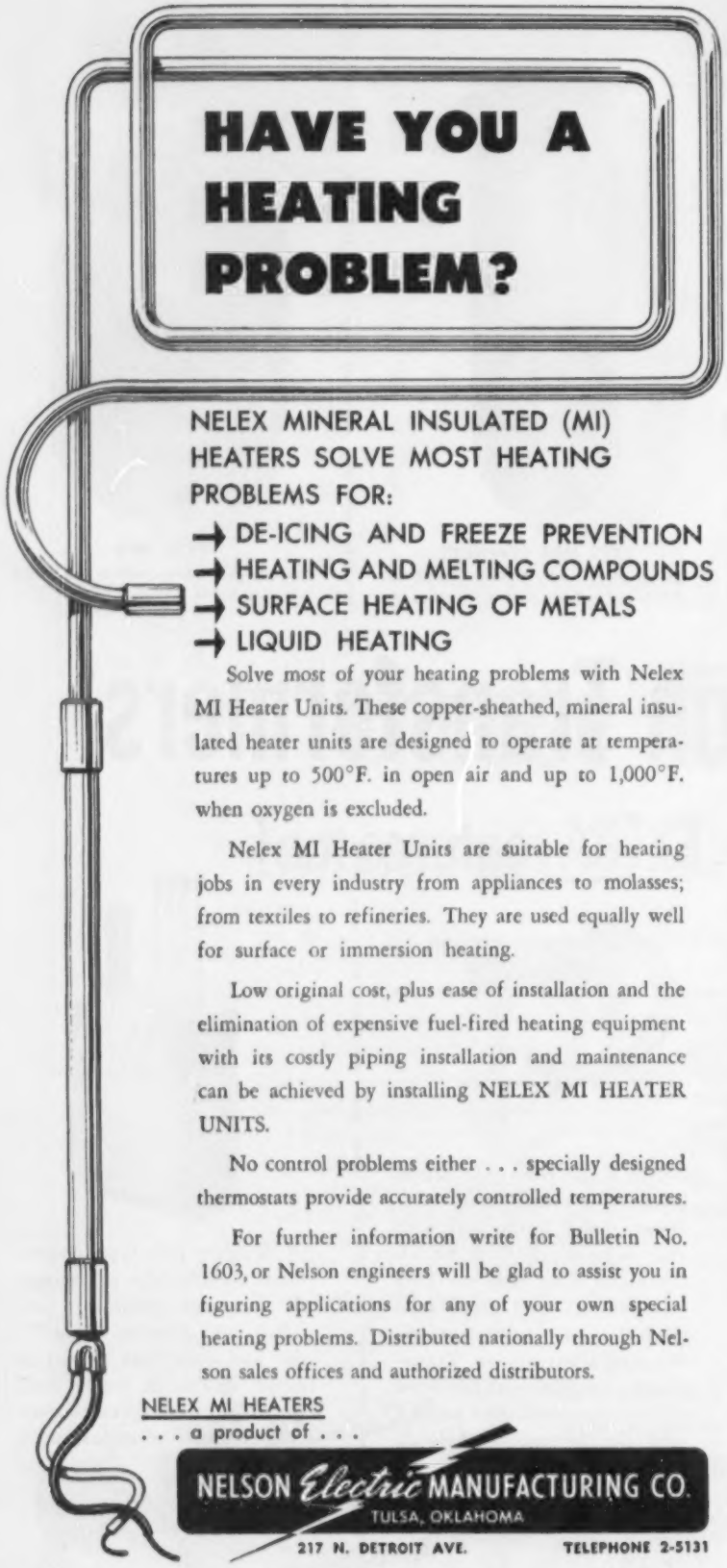


The high voltage sidewall bushings used on Wagner Distribution Transformers permit faster, easier, safer permanent connections. The conductor slips into the connector—no special tools are needed. The connector is then tightened by a few turns of the insulated finger-grip knob.

All Wagner pole-type transformers in round tanks have covers sealed to the tank with the Wagner SHUR-SEAL Clamping Ring that prevents "breathing" and gives true sealed-tank construction. Wagner Distribution Transformers are filled with inhibited oil to reduce oxidation and retard the formation of acids and sludge.



All Wagner pole-type single-phase transformers in ratings 167 kva and below are furnished with Wagner Form W core and coils that permit a liberal design in small size, lightweight transformers that give excellent electrical performance.


HAVE YOU A HEATING PROBLEM?
NELEX MINERAL INSULATED (MI) HEATERS SOLVE MOST HEATING PROBLEMS FOR:
→ DE-ICING AND FREEZE PREVENTION
→ HEATING AND MELTING COMPOUNDS
→ SURFACE HEATING OF METALS
→ LIQUID HEATING
Solve most of your heating problems with Nelex MI Heater Units. These copper-sheathed, mineral insulated heater units are designed to operate at temperatures up to 500°F. in open air and up to 1,000°F. when oxygen is excluded.
Nelex MI Heater Units are suitable for heating jobs in every industry from appliances to molasses; from textiles to refineries. They are used equally well for surface or immersion heating.
Low original cost, plus ease of installation and the elimination of expensive fuel-fired heating equipment with its costly piping installation and maintenance can be achieved by installing NELEX MI HEATER UNITS.
No control problems either . . . specially designed thermostats provide accurately controlled temperatures.
For further information write for Bulletin No. 1603, or Nelson engineers will be glad to assist you in figuring applications for any of your own special heating problems. Distributed nationally through Nelson sales offices and authorized distributors.
NELEX MI HEATERS
. . . a product of . . .
NELSON Electric MANUFACTURING CO.
TULSA, OKLAHOMA
217 N. DETROIT AVE.
TELEPHONE 2-5131
Manufacturers of electrical control equipment for industry.

New Equipment

(*Continued from page* 216)

liance without increased lamp current. A capacitor is used as a ballast for 400-cps operation. Dimming of the lamps is accomplished by switching in a smaller capacitor.

Bogue Electric Manufacturing Co, 52 Iowa Ave, Paterson 3, N. J.

Insulating Tape

A black tape, known as No. 25 electrical filler tape, is an insulating compound ⅛-in. thick. It is wound with a fabric separating strip to form a roll. The rolls are available in 1.5-in. widths.

Areas to be built up can be thumb-molded to shape by thicknesses pressed on at low spots with pieces of the filler and rapidly squeezed to dimensions. The tape fuses to a homogeneous mass in seconds. Also, it can be used to cover sharp-cornered electrical connections, and pad edges of bus bars.

Bishop Mfg Co, 6 Canfield Rd, Cedar Grove, N. J.

Soldering Gun

A heavy duty electronic soldering gun heats in 3 sec for soldering or plastic-cutting jobs.

Known as the Quick Hot Model 250, the gun has been given a straight-line design and built-in spotlight to improve visibility. Its rigid tip is designed to stay tinned indefinitely, but can be easily replaced. It operates on 120 v, 60 cycles.

Wen Products, Inc, 5808 Northwest Highway, Chicago 31, Ill.

Truck-Mounted Ditcher

Ditching machine mounted on a four-wheel-drive truck is flexible and fast in the field. The Model 711 can be operated from its cab, or by a man standing beside the machine. It can travel 45 mph between jobs. Vertical clearance is 10 ft 4 in.

It digs a 3½ or 5 ft ditch depending upon the boom with which it is

(*Continued on page* 222)

Ansul

is the only dry chemical fire extinguisher backed by a five year warranty!

Here is proof of Ansul's superiority . . . *a five year equipment warranty*, the only one of its kind in the fire control industry.

For the buyer of fire equipment this important warranty means many *extra* years of trouble-free protection plus freedom from costly and frequent maintenance checks and repairs.

The special design and construction features that make this warranty possible provide not only dependable protection but also *fast*, *effective* fire control. Ansul's *weather-tight* construction keeps out moisture and resists corrosion. *Patented nozzles* deliver the right kind of stream for your fire protection problem. The *sealed pressure cartridge* puts Ansul's "Plus Fifty" dry chemical to work immediately—no delay or lag. And finally *rugged construction* makes it possible for Ansul equipment to give peak performance under the toughest operating conditions.

HERE IS THE BIG TRAINING AND SERVICE PLUS OFFERED ONLY BY ANSUL!
Available without cost to all Ansul users.

Training for your personnel at your plant by Ansul specialists.

Customer training school at Marinette for your key safety personnel.

Visual aids on fire control for your safety meetings and other training.

In-plant survey to scientifically determine your fire protection needs.

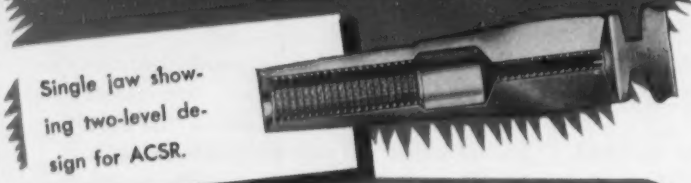
Call the Ansul Man!

ANSUL

Get in touch with your local Ansul man through the "yellow pages" or write ANSUL CHEMICAL COMPANY, Fire Equipment Div., Dept. F-13, Marinette, Wisconsin.

THESE GREASED GRIPPING CHUCKS
HOLD
STEEL STRAND AND ACSR IN RELIABLE SPLICES AND DEADENDS

Single jaw for 3/8" steel strand has 165 teeth.
Cutaway showing complete gripping chuck assembly. Here's how floating jaws surround and HOLD conductor.



Extensive research has shown the way to make self-acting splices and deadends to HOLD even steel strand. These same basic principles are now applied to all other Reliable gripping chucks made to HOLD ACSR, copper and aluminum.

Look at the illustration of the jaw for 3/8" steel strand. Note the number of sharp teeth. This size chuck has 495 individual teeth that engage the wire instantaneously and HOLD permanently. Made in six sizes for No. 8 wire to 7/16" strand. They even HOLD such high tensile steels as are used in prestressed concrete construction (260,000 to 290,000 P.S.I.)

The second jaw above is for No. 2 ACSR and features the two-level design that permits the steel core and the aluminum conductor to be gripped and HELD by the same chuck. In this size a total of 84 individual teeth grip the steel core and 396 more surround and HOLD the aluminum strands.

The gripping chucks, used in Reliable splices and deadends, are designed and made to HOLD permanently. Tension applied momentarily, during installation, assures an electrical joint that is of less resistance than the conductor.

A momentary tension of about 15% of rated wire strength is enough to produce and maintain this low resistance joint.

Reliable ELECTRIC COMPANY 3145 Carroll Avenue Chicago 12, Ill.

Over 45 years service to the utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

New Equipment

(*Continued from page* 220)

equipped. Ditch width can be varied from 8½ to 12, 15 or 18 in. by switching sets of teeth and cutter bars.

The truck's shock-free power transmission drives it forward at digging rates up to 13 ft a min. The bucket line operates at three independent speeds.

Barber-Greene Co, 400 North Highland Ave, Aurora, Ill.

MORE NEW PRODUCTS
about which you should know

Zenith Electric Co, 152 W. Walton St, Chicago 10, Ill., has process **timer** for turning circuits on and off for periods up to 94% of cycles 15 sec to 24 hr long.

Ilsco Corp, Cincinnati 27, Ohio, has VT and LO 2-hole collar **solderless lugs** in 6 sizes for 14 AWG to 1,000 Mcm wire.

Gemco Electric Co, 25681 W. 8 Mile Rd, Detroit 19, Mich., has **test bench** for inspection and test of high voltage wire to SAE specifications.

The Electrical Mfg. Co, 407 Lake Ave, Racine, Wis., has foot-operated **carbon rheostat,** Series 3000, for control of small motors.

Carboloy Dept of General Electric Co, Detroit 32, Mich., has added 117 sizes of standard **tools and blanks** for steel cutting operations in the Series 300 carbide tools.

Atlas Mineral Products Co, Mertztown, Pa., has **hot-poured cement,** Atlastic 60, for adhesion to ceramic surfaces; can join vitrified clay pipe to give chemical-resistant joint.

Sylvania Electric Products Inc, 1740 Broadway, New York 19, has multipurpose large **strip-fixtures,** the Suburban line, for 2, 3, 4, 6, and 8 fluorescent lamps, 4, 8, or 16 ft lengths.

Irvington Varnish & Insulator Div, Minnesota Mining & Manufacturing Co, Irvington, N. J., has improved formulation for its black Temflex 105

plastic tubing for operation at 105 C, giving improvement in heat deformation and greater resistance to "cut through" (Samples available).

Schramm Inc, West Chester, Pa., has pneumatic **sump pump,** usable with 105 or 125 cfm compressor (Bulletin available).

Atlas Mineral Products Co, Mertztown, Pa., has foamed-in-place **cellular isocyanate plastics.** Supplied as 2-package units and mixed on the job, it produces thermal and sound insulation with density of 2-20 lb/cu ft.

Square D is now packaging **motor starter** replacement and modification components for sale through electrical distributors.

Central Scientific Co, 1700 Irving Park Rd, Chicago, Ill., is distributor to the laboratory supply field for the **electronics hobby kit** and other science kits (See EW, Oct. 4, p. 140.)

General Electric Co, 1 River Rd, Schenectady 5, N. Y. has multi-crystal **ultrasonic generator** for industrial cleaning equipment . . . GE has a 5-kw **induction heater** designed for brazing, soldering, and laboratory projects . . . GE also has new inert-atmosphere, **arc-melting furnace** for highly reactive or refractory metals.

Atlas Mineral Products Co, Mertztown, Pa., has Plastaloy **reinforced plastic** structures as standard sized tanks, stacks, and ductwork . . . General Electric Co, Bridgeport 2, Conn., has high-temperature silicone-rubber-insulated **appliance and fixture wire,** control cable, heating cable, and power cable, for operation to 200 C.

Electromode Corp, Rochester, N. Y., has electric **baseboard heaters,** 600 w, 120/240 v, 32 x 8½ x 3 in.

Infra Electronic Corp, 553 Eagle Rock Ave, Roseland, N. J. has **turns-measuring set,** range 1 to 1,999 turns, having comparative accuracy of 0.1% and absolute accuracy of 0.5%.

Atlas Mineral Products Co, Mertztown, Pa. has Schedule 40 and 80 **plastic pipe** in IPS sizes up to 6-in. O. D., based on high-impact polyvinyl chloride, normal-impact polyvinyl chloride, and styrene rubber plastic. It is made in 10 and 20 ft lengths.

THESE GREASED GRIPPING CHUCKS

HOLD

COPPER AND ALUMINUM CONDUCTOR IN RELIABLE SPLICES AND DEADENDS

Literally hundreds of teeth grip and HOLD the copper conductor.
Conductor is almost completely surrounded by the Reliable gripping chuck assuring an overall permanent grip.
Jaw used in Reliable deadends to HOLD aluminum strand or solid wire.

In developing gripping chuck jaws that HOLD high tensile steel strand, Reliable researchers developed new jaw designs that grip and HOLD permanently not only steel strand and ACSR, but also copper and aluminum. These designs are now used in all Reliable splice and deadend gripping chucks.

On each copper gripping chuck jaw for 2/0 copper conductor, there are 126 cold-forged engaging teeth or a total of 378 individual HOLDING points in each three-jaw chuck. The teeth, the chucks and the precision tapered cases are scientifically designed and precision made to HOLD permanently.

The aluminum jaw illustrated above is for No. 2-7 str. aluminum. The three-jaw gripping chuck is provided with 315 individual, keen-edged teeth that grip the strand instantaneously and HOLD permanently without damage to the strands.

A tight, low-resistance electrical joint is assured with Reliable splices when momentary tension is applied at time of installation. Reliable splices properly installed will actually run cooler than the conductors.

A momentary tension of about 15% of rated wire strength is enough to produce and maintain this low resistance joint.

Reliable ELECTRIC COMPANY 3145 Carroll Avenue Chicago 12, Ill.

Over 45 years service to the utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

SYLVANIA ANNOUNCES
THE NEW SUPER DELUXE FLUORESCENT LAMP

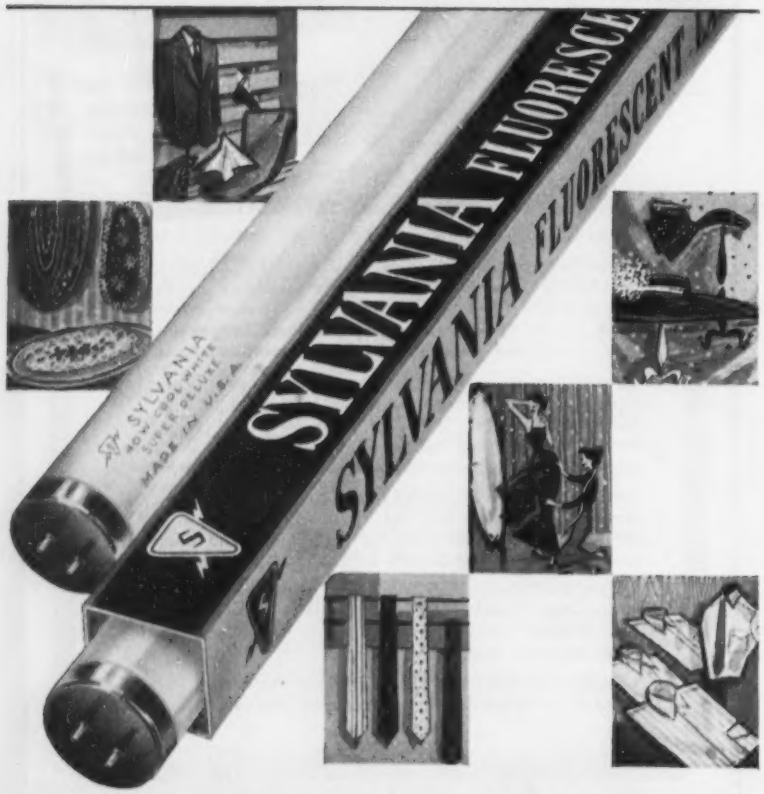
Makes Merchandise Look More Colorful and Attractive

Sylvania's new Super Deluxe fluorescent lamps are the answer to your problem of showing merchandise at its most colorful best. These new lamps give the best overall rendition of color yet achieved by fluorescent lamps, not only improving the appearance of the merchandise being displayed, but also giving a more flattering appearance to customers and sales people.

This new lighting tool can mean dollars and cents to all sellers of goods to whom attractive appearance of merchandise means more sales.

For full details on this new Super Deluxe fluorescent lamp, write for Booklet Fl-532, Sylvania Electric Products Inc., Dept. 4L-2832 1100 Main St., Buffalo 9, N. Y.

LIGHTING FOR **COLOR** IS LIGHTING FOR **SALES!**



SYLVANIA

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine Street, Montreal, P. Q.

Lighting · Radio · Electronics · Television

CATALOGS · BULLETINS

● **TURBINES:** Today's Trends and Tomorrow's Turbines (03R8182), by Wilson and Hansen, is reprinted from Allis-Chalmers Electrical Review. Eight pages, it discusses reheat for smaller turbines, tandem vs close-coupled cross-compound, etc. Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

● **BOILER BAFFLES:** Bulletin BW54 (20 pages) covers boiler baffles and how they are designed for the streamlined flow of the gas of combustion over the heat-absorbing surfaces. More than 30 boiler-setting plans are shown with an analysis of each. The Engineer Co, 75 West St, New York 6, N. Y.

● **GAS TURBINE:** GEA5962 (12 pages) covers gas turbines for pipeline pumping. General Electric Co, 1 River Rd, Schenectady 5, N. Y.

● **TURBINE FACTORY:** Highlights—West Allis Works, 32 pages, is a pictorial "tour" through a factory valued over $57 million and making turbines, diesels, tractors. Allis-Chalmers Manufacturing Co, Box 512, Milwaukee 1, Wis.

● **PACKAGED COILER CONTROL:** Pub. No. 53-1088-239 (4 pages) covers automatic, all-electric, metering-type packaged control for water-tube packaged boilers. The Hays Corp, Michigan City, Ind.

● **LOAD-CENTER TRANSFORMERS:** Catalog 132 (20 pages) covers load-center transformers up to 2,500 kva. Charts show weights, dimensions, and performance data for any desired kva rating and combination of auxiliary equipment. Other charts show throats, junction boxes, oil-fused cutouts, disconnecting switches, cover bushings, air-interrupter switches, etc. R. E. Uptegraff Mfg Co, Scottdale, Pa.

● **DISTRIBUTION TRANSFORMER:** GEA-6070 (24 pages) describes distribution transformers and their features: impulse testing, nitrile rubber gaskets, Magne-Valve arresters, etc. General Electric Co, 1 River Rd, Schenectady 5, N. Y.

● **BREAKER OPERATOR:** Type OA hydraulic operating mechanism for power circuit breakers is described in Catalog 587, 4 pages. Pacific Electric Mfg Corp, 5815 Third St, San Francisco 24, Calif.

● **5-KV RUBBER CABLES:** Bulletin 1085, 128 pages, catalogs O-5kv Okolite-Okoprene rubber-insulated cables. Current-carrying capacity tables, short-circuit curves, voltage-regulation formulas, and methods for determining conduit sizes, pulling tension, and bending radii are included on this unshielded, neoprene-sheathed cable. Advantages of cables not requiring shielding for 4,160-v operation are discussed. Four main sections are: construction features; engineering information; installation and handling techniques; splicing and terminating procedures. The Okonite Co, Passaic, N. J.

● **POWER CONNECTORS:** Bulletin 521, 12 pages, covers Type "W" power connectors. Seven connectors cover range of 4 solid through 2,000 Mcm cable. Memco Engineering & Manufacturing Co, Inc, Commack, L. I., N. Y.

● **PLUG-DUCT:** Bulletin 300 (24 pages) covers "Plug-Duct," a plug-in bus duct. Continental Electric Equipment Co, Box 1055, Cincinnati 1, Ohio

● **CONTROL CENTERS:** Motor control centers of standardized, modular design are covered in Bulletin 401 (8 pages). Continental Electric Equipment Co, Box 1055, Cincinnati 1, Ohio

● **ENGINE-GENERATOR SETS:** Bulletin G-6 (8 pages) covers 50-350kw engine-generator sets, 60 to 675 hp. Alternate

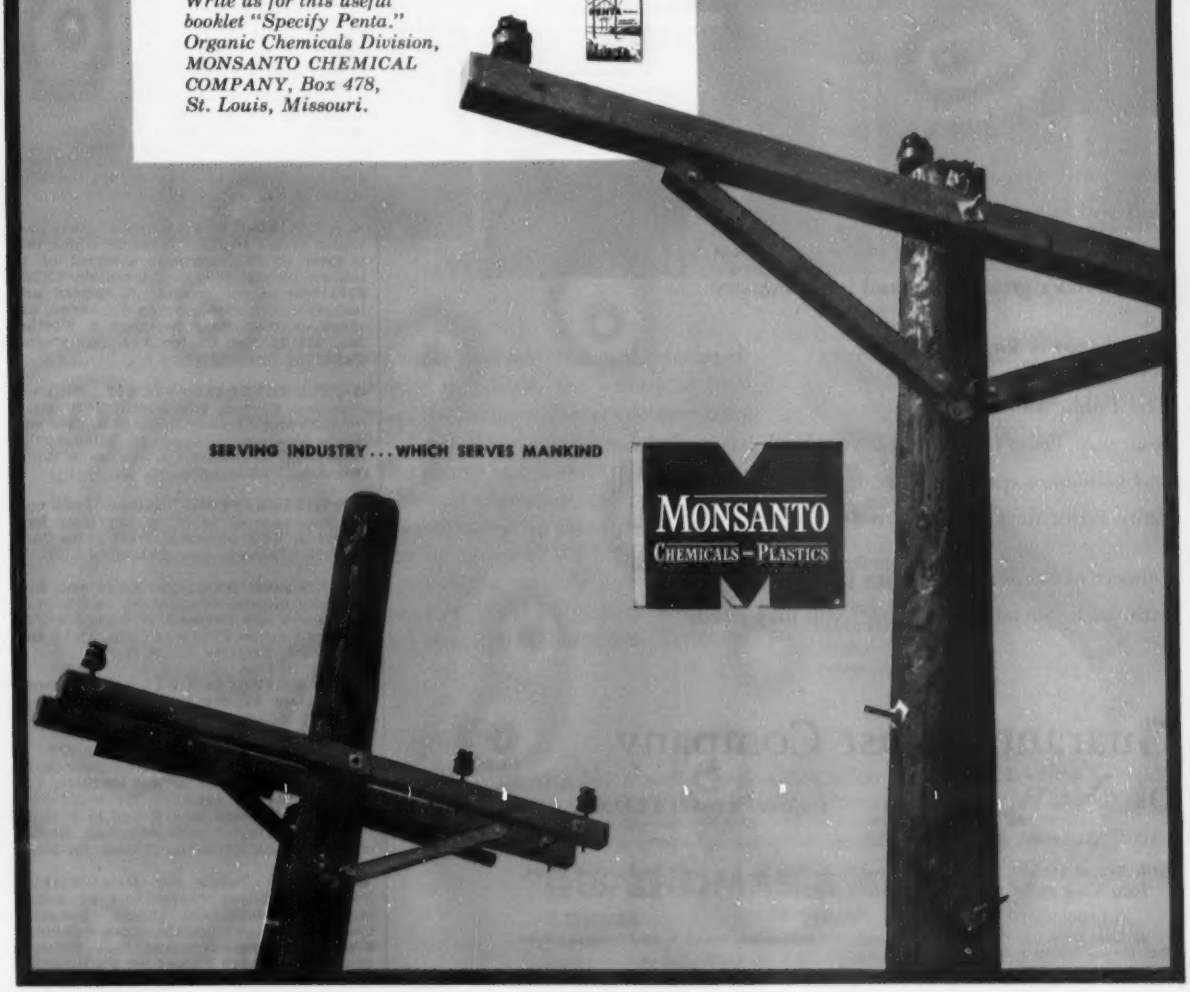
For Pacific Gas & Electric—

MONSANTO PENTA GIVES WOOD 4 LIVES

POLES AND CROSSARMS treated with Monsanto Penta will have at least four times the service life of untreated materials. Penta—on the job for Pacific Gas & Electric Company—protects wood against decay and insect attack for many years.

LINEMEN LIKE PENTA-TREATED WOOD. It's clean, easy to handle, does not irritate the skin or "burn" hands. Penta in wood is not messy, will not bleed out to stain clothing. It leaves wood paintable if specified. When you specify Penta, you protect your investment in a farsighted way: well-preserved, clean poles are an asset.

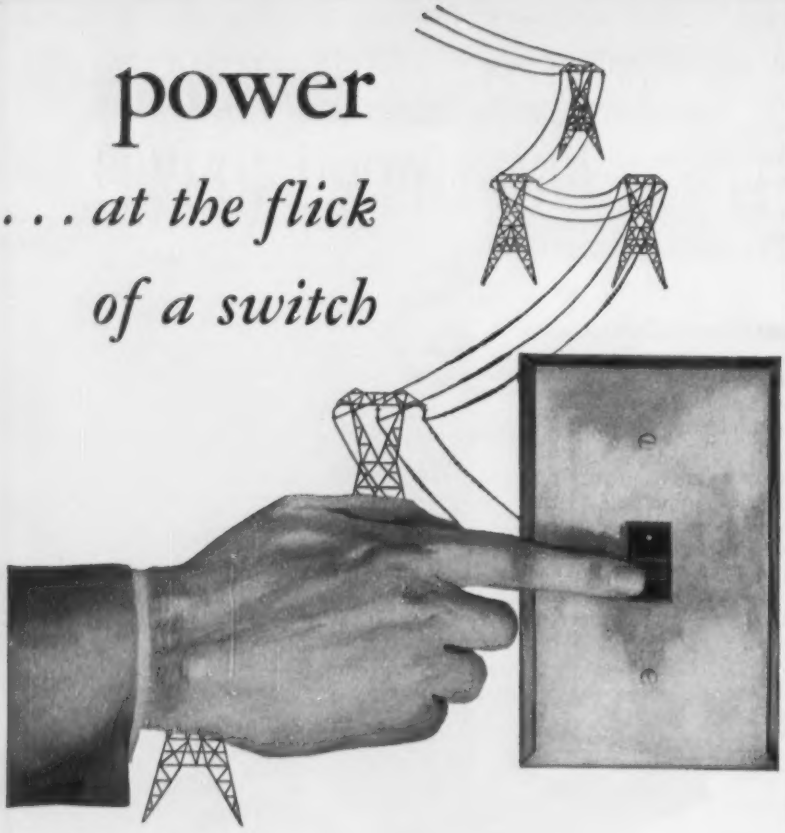
Write us for this useful booklet "Specify Penta." Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478, St. Louis, Missouri.



SERVING INDUSTRY . . . WHICH SERVES MANKIND

MONSANTO
CHEMICALS – PLASTICS

power
. . . at the flick of a switch



Along with managerial skill and foresight, there is a companion factor inherent in the expansion of America's great power and light industry.

That factor is sound financing.

The Public Utilities Division of Guaranty Trust Company of New York has had close and valuable experience through the years with many major developments in the industry.

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fuel systems permit use of natural gas, LPG, gasoline, and gas-gasoline or sludge-gas fuels. Bulletin E-7 (8 pages) covers L-3460 and L-4000 engines (600 and 675 hp). Le Roi Division, Westinghouse Air Brake Co, 1706 South 68th St, Milwaukee 14, Wis.

● **DIESEL ENGINES:** Bulletin 235 (12 pages) covers 2-cycle, Duafuel Type TS-29 stationary and marine diesel engines, 5,000 to over 10,000 hp. Nordberg Manufacturing Co, Milwaukee 1, Wis.

● **OIL FILTERS:** Bulletin F132 (8 pages) covers oil filters for hydraulic fluids. Hilliard Corp, Elmira, N. Y.

● **INDUCTION HEATING:** Bulletin 60, 4 pages, shows line of hf induction melting and heating equipment, 20 to 1,250 kw, with capacity charts. Inductotherm Corp, 620 E. Genoiden Ave, Glenolden, Pa.

● **PORTABLE PLATERS:** One-page price list covers portable platers and supplies. Rapid Electroplating Process, Inc, 1414 S. Wabash Ave, Chicago 5, Ill.

● **WEIGH SCALE:** Catalog 20, 4 pages, shows platform scale using strain gage load cells and pneumatic tare weight for net measurement, for up to 10,000 lb, for batch or continuous process control. Weighing Components, Inc, 64 Fulmor Rd, Hatboro, Pa.

● **CHEMICAL FEED:** Bulletin 1253, 24 pages, covers controlled-volume pumps for flow controllers, ratio controllers, and final control elements in process instrumentation. Milton Roy Co, Station Y, 1300 E. Mermaid Lane, Philadelphia 18, Pa.

● **GEIGER COUNTERS:** A 4-page folder catalogs a line of geiger counters designed for prospecting applications. El-Tronics, Inc, Fifth & Noble St, Philadelphia 23, Pa.

● **ALARM SYSTEMS:** A 12-page booklet covers principles of ultrasonic alarm systems operating on the doppler effect to detect moving objects or fire. Walter Kidde & Co, Inc, Belleville 9, N. J.

● **HIGH SPEED CAMERA:** Four-page folder covers framing cameras which take a total of 25 frames at a speed of 1.2 million (Model 189) or 2.4 million (Model 222) frames per second. Suggested uses include combustion, corona-discharge, and shock-wave studies. Beckman & Whitley, Inc, 912 E. San Carlos Ave, San Carlos, Calif.

● **TELEMETERING:** IDS 9.1-9a sheet describes electric telemetering equipment for high-speed transmission of system variables to a central location. Minneapolis-Honeywell Regulator Co, Wayne & Windrim Ave, Philadelphia 44, Pa.

● **WHITEPRINTER:** Bulletin 5485 covers Speedmaster 1400C whiteprinter having 44-in. wide capacity. P&H Sales Corp, 5640 N. Western Ave, Chicago 45, Ill.

● **RF NOISE METER:** Noise and field intensity meters, attenuators, and impulse generators are covered in 6-page folder. Empire Devices Products Corp, 38-15 Bell Boulevard, Bayside 61, N. Y.

● **FAN HEATERS:** A 4-page folder covers fan heaters for the home. Nesco, 250 N. 12th St, Milwaukee 1, Wis.

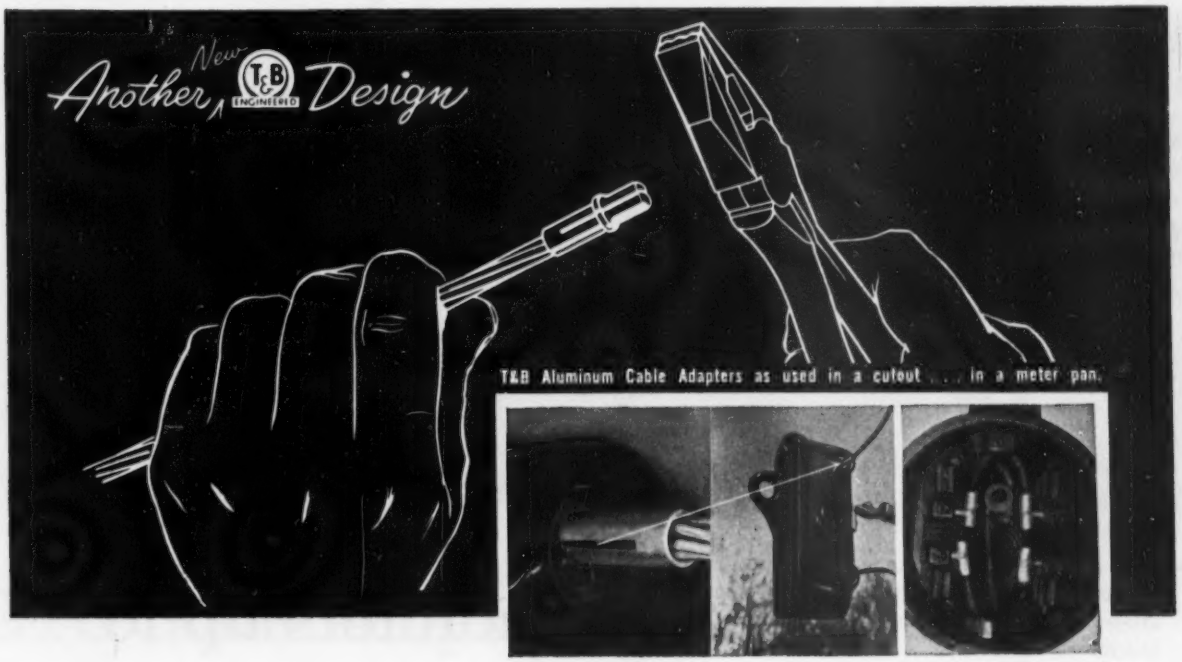
● **SURFACE LIGHTS:** Form 690 (4 pages) covers the Chalkboarder fluorescent fixtures for lighting vertical surfaces. The Chalkboarder is designed for rapid-start and slimline lamps, in 4, 8, and 16-ft units, individual or continuous mounting. Smithcraft Lighting Division, Chelsea 50, Mass.

● **PAINTS:** Paints for Metal-Working Plants, 28 pages, covers line of metal-working maintenance paints, including fume resisting paints, non-yellowing whites, and acid-resistant floor finishes. Flexrock Co, 3620 Filbert St, Philadelphia 1, Pa.

IF YOU'RE WIRING WITH ALUMINUM . . .

Utility Engineers are now installing aluminum cable in many places where only copper had been suitable. Equipment such as transformers, capacitors, cutouts, switches, and meter pans, having terminals designed for copper conductors, are now being wired to aluminum and A.C.S.R. with little or no difficulty.

How? T&B's new Aluminum Cable Adapters. They're made of heavily-tinned copper alloy; take up little more space than the cable; install in a jiffy. A lineman or electrician merely taps one onto the end of the conductor, then clamps the adapter as though it were copper conductor. "Straight" and "flag" types are available. The flag type is best for connections at right angles to cable outlets.



One of the outstanding features of these new adapters is the serrated bore. As the adapter is tapped onto the cable, the serrations bite through the aluminum oxide coating. The high-conductivity connection thus formed is maintained, despite weather and moisture, by an oxide inhibitor precoated in the bore. The clamp end is slotted and spring-like to maintain pressure during thermal expansion and contraction.

These versatile Cable Adapters are opening up many new applications for aluminum cable. Sizes for cable up to #2 Str. at present. If you're wiring with aluminum, you might possibly have a unique application. If so, let us know about it. We'll be glad to send you a free sample of the adapter and descriptive literature. Write to The Thomas & Betts Co. today.

Note how the bare serrations have scraped through the oxide coating on the cable end.

LOOK FOR THIS SIGN — AUTHORIZED DISTRIBUTOR T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-415

THE THOMAS & BETTS CO.

INCORPORATED

14 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

"Dated" instruments drain away dollars

Instruments can become outmoded . . . just like automobiles and ideas. Progressive instrument development is constantly making many older designs obsolete . . . and such obsolescence can be a steady drain on profits.

Modern instruments save money

Honeywell engineers are proving this fact every day—in a growing number of plants, on all types of processes. Where out-of-date controls have been replaced by modern Honeywell instrumentation, economy-minded engineers and management men have really opened their eyes. And with good reason, for—

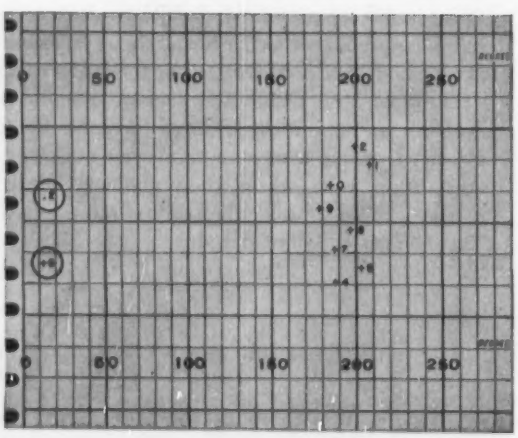
- Modern Honeywell instrumentation saves labor. Centralized control, automatic time-cycle systems, and other recent control concepts save countless wasted steps . . . reduce routine man-hour expenditures.
- Modern Honeywell instrumentation cuts maintenance costs. It affords longer, uninterrupted operation . . . is designed for easy service . . . requires minimum attention.
- Modern Honeywell instrumentation reduces rejects. It maintains the tighter process tolerances demanded by today's more exacting specifications.
- Modern Honeywell instrumentation improves product quality. Precision measurement and control remove any chance of error or guesswork in critical processes.
- Modern Honeywell instrumentation makes cost accounting more accurate than ever before. Everything is a matter of record.

An investment that really pays off

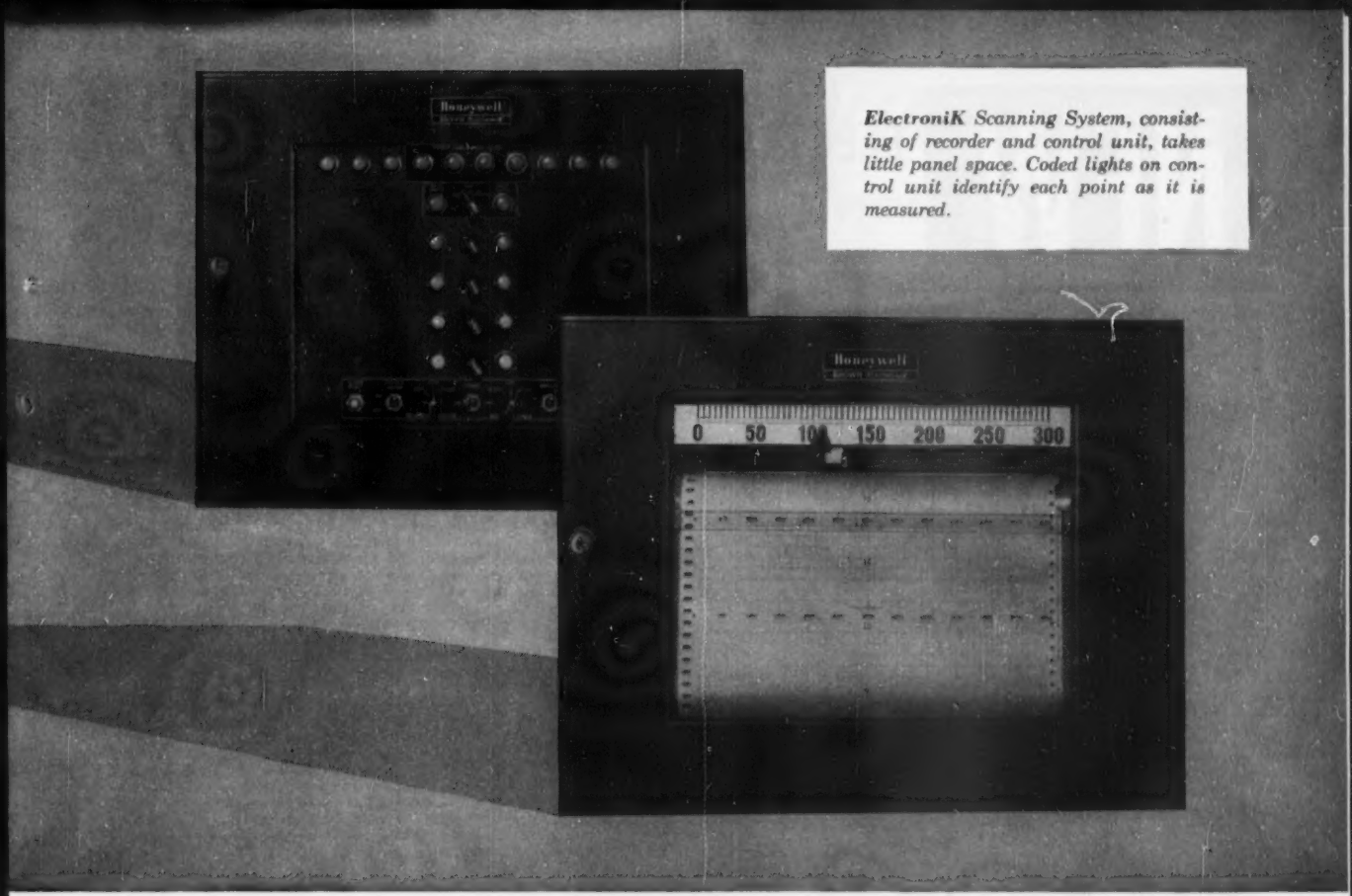
Just being "instrumented" is not enough. You can get more out of your instrument dollar, from both a product and service standpoint, with Honeywell instrumentation . . . the ultimate in engineering and design . . . insurance for your equipment investment.

Replacing with Honeywell is one of the best ways to invest your modernization appropriation. A Honeywell application engineer will gladly survey your present plant instrumentation . . . give you a practical recommendation that will make dollars and sense. Give him a call . . . he's as near as your phone.

This economical, versatile system monitors up to



Sample chart shows how all 270 points are clearly identified on the record.



ElectroniK Scanning System, consisting of recorder and control unit, takes little panel space. Coded lights on control unit identify each point as it is measured.

270 plant temperatures

THE TIME, expense and uncertainties of periodic tours to check temperatures at potential "hot spots" in the plant can be materially reduced by the *ElectroniK* Scanning System. This instrumentation makes temperature monitoring completely automatic and efficiently centralized. A single instrument watches 270 different temperatures in bearings, oil lines, boiler tubes, pumps . . . anywhere you can install a thermocouple.

Because of its exceptionally large capacity, the *ElectroniK* Scanner does the work of up to 16 old-style instruments . . . affords effective overheat protection at low cost per point.

It's fast—scans through successive thermocouples at speeds up to one second per point. Each point is checked at 4½ minute intervals . . . far more frequent than the best manual checks.

It signals overheat. Annunciator contacts are actuated whenever any point in a bank of nine exceeds a preset limit. Different limits can be set for each bank.

It's versatile. At the flick of a switch, the operator can choose:

1. Continuous recording of all 270 points, with positive identification of each.
2. Recording of only those points which exceed a preset limit.
3. Continuous scanning without recording.
4. Selective recording or scanning of pairs of nine-point banks.

Models with less than 270 points are available to meet your individual needs. Your nearby Honeywell sales engineer will be glad to discuss your own plant's requirements . . . and he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

● **REFERENCE DATA: Write for Data Sheet No. 10.0-9, "*ElectroniK* Scanning System."**

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

NEW ELECTRO SWITCH CATALOG

A CATALOG OF

Low-cost → *Dependable*

ROTARY MULTIPOLE SWITCHES for INSTRUMENT, TRANSFER, and SELECTOR SERVICE.

ESCO instrument switches permit control of complex circuits with a single compact switch instead of separate switches.

This catalog covers ESCO Type P snap-acting switches, with up to four selector positions, handling 10 amperes at 120 volts a-c, 5 amperes at 240 volts a-c, 3 amperes at 450 volts a-c or 5 amperes at 125 volts d-c, 3 amperes at 250 volts d-c.

The catalog also lists ESCO JR detent-action switches with up to eight selector positions, handling 10 amperes at 125 volts a-c or 5 amperes at 125 volts d-c.

The basic structure of ESCO rotary switches provides for extreme flexibility in design. Tell us your circuit arrangements and the sequences you need, and we will recommend the correct switch for your use.

Write TODAY for your copy of this new catalog.

ELECTRO SWITCH
CORPORATION
Weymouth 88, Massachusetts

TECHNICAL LITERATURE

ASTM STANDARDS—Following are available from American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.:

● Standards on Metallic Electrical Conductors (Copper and copper alloys, copper-covered steel, aluminum, iron, and steel), 280 pages, 6 x 9, paper cover, $3.25. The October 1954 edition brings together ASTM standards on metallic electrical conductors, developed by ASTM Committee B-1 on Wires for Electrical Conductors, and related standards from other ASTM Committees. It includes 49 standards, of which 21 are revisions and 3 are new. Most of these standards have been adopted as American Standard by ASA.

● Specifications for Steel Piping Materials (Pipe, tubes, castings, forgings, bolting), 370 pages, $3.75. This 1954 edition sponsored by ASTM Committee A-1 on Steel contains 53 specifications for carbon-steel and alloy-steel pipe and tubing, including stainless. Materials covered include pipe for liquids, vapors, and gases at normal and elevated temperatures; boiler, superheater, and miscellaneous tubes; heat-exchanger and condenser tubes; and still tubes for refinery service.

● Standards on Adhesives (Specifications, physical tests, definitions, and related information), 216 pages, $1.75. September 1954 edition includes 42 ASTM standards and is sponsored by Committee D-14 on Adhesives. Standards cover adhesives, rubber cements, brake shoe adhesives and vulcanized rubber, electrical insulation, and miscellaneous test methods and specifications.

● Standards on Textile Materials (Specifications, tolerances, methods of testing, definitions, terms, and related information), 718 pages, $5.50. October 1954 edition covers 111 ASTM standards, is prepared by Committee D-13 on Textile Materials. Standards cover asbestos, bast and leaf fibers, cotton, glass textiles, rayon, acetate, and silk, wool, pile fabrics (carpets), felt; and general fibers, fabrics, yarns, threads, and cordage. New tentative test methods include determination of build-up and spread of glass yarn as wrap or braid over electrical conductors.

● Standards on Plastics (Specifications, methods of testing, nomenclature, definitions), 741 pages, $5.75. May 1954 edition includes 142 ASTM standards, is sponsored by Committee D-20 on Plastics. Standards cover properties (strength, hardness, thermal, optical, and permanence); analytical methods; molds and molding processes; conditioning; plates, sheets, tubes, rods, and molded materials; and electrical tests. New material includes specs and tests for cellulose acetate sheet and film for primary insulation.

● Standards on Materials for Radio Tubes and Electronic Devices and Electrical-Heating, Resistance, and Related Alloys (Also lamps, electric-furnace alloys, heat-resisting alloys, electrical-contact materials, thermostat metals), 244 pages, $2.75. The 1954 edition includes 44 ASTM standards, is prepared by ASTM Committee B-4 on Electrical-Heating, Resistance, and Related Alloys. New material includes specifications on hardness of electrical contact materials.

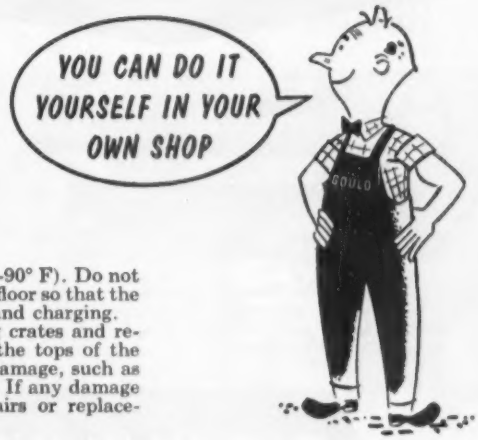
● Tentative Specifications for nickel and nickel-base alloy covered welding electrodes, ASTM B295-54T (AWS A5.11-54T), issued by American Welding Society. These new specifications cover electrodes for welding nickel and nickel-base alloys individually to themselves and also for welding these materials to steel. Also included are filler metals for welding clad side of nickel-base alloy clad steels. 12 pages, price 25¢

HERE'S MONEY SAVING TIP #3

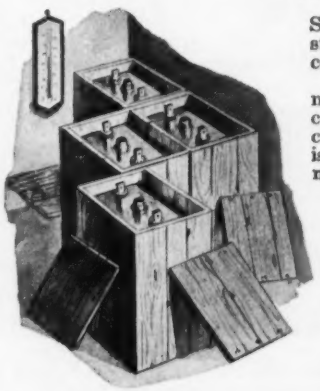
from the GOULD Plus-Performance Plan

HOW TO STORE A WET BATTERY

Frequently it becomes necessary to store batteries for an extended period of time before they are placed in service. To be sure that the batteries are maintained in the best possible condition during this storage period, the Gould Plus Performance Plan shows you how to do it yourself.



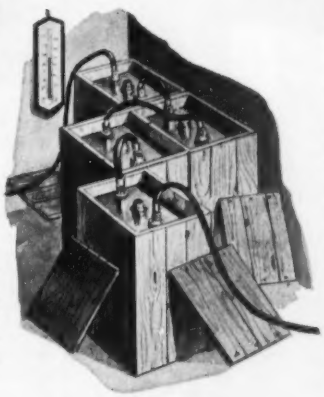
1. Open and Inspect



Select a cool, dry room for storing (60°-90° F). Do not stack the crates, but have them on the floor so that the cells will be accessible for inspection and charging.

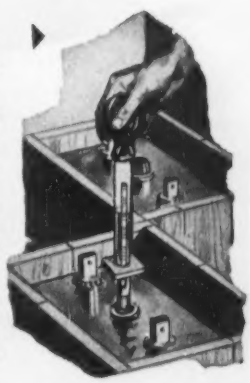
Remove the tops from the shipping crates and remove packing material from around the tops of the cells. Examine the cells for shipping damage, such as cracked jars, spillage or other damage. If any damage is apparent, have the necessary repairs or replacements made at once.

2. Connect in Series



Connect the cells in series, negative to positive and then connect to some DC source of power where a low rate of charge can be obtained. Connect the positive terminal to the positive lead of the charging source and the negative terminal to the negative lead of the charging source.

3. Check Specific Gravity



Every thirty days take hydrometer readings of several cells. If any cell reads as low as 1.200 specific gravity, charge at the recommended finishing rate until a constant voltage and specific gravity are obtained for 4 readings taken at hourly intervals. These readings should be taken while the cells are on charge. In the event the charging equipment available does not have sufficient voltage to charge the entire battery at once, the battery may be split up into smaller units and each unit charged separately.

GOULD Batteries

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

For Railroad Air Conditioning and Lighting | For Mine Shuttle Cars and Locomotives | For Electric Industrial Trucks | For Diesel Locomotive Starting | For Standby and Emergency Power

©1954 Gould-National Batteries, Inc.

Always Use Gould-National Automobile and Truck Batteries

There are many ways in which you can cut battery maintenance costs. Doing simple jobs like this, in your own plant, is the answer. The Gould Plus-Performance Plan gives you the "know-how" to "do it yourself." Send for the complete plan and start saving money. Mail this coupon TODAY!

BATTERY INFORMATION HEADQUARTERS
Dept. EW-124 Trenton 7, N. J.

Please send me, without charge or obligation, the Gould Plus-Performance Plan for _____ batteries.
(type or types)

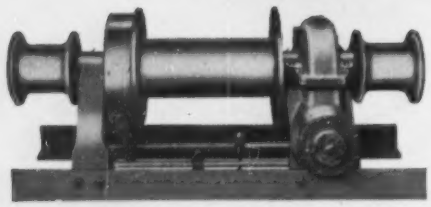
Name _____

Firm _____

Address _____

City _____ Zone _____ State _____

TULSA* WINCHES



The Model 23 Tulsa Winch is installed on the truck below. There are 27 other models in capacities from 6,500 to 80,000 lbs. for all makes and models of trucks and crawler tractors.

FOR HAULING...

Loading and unloading 3-ton cable reels is a simple task for this California trucking contractor. Working for a West Coast public utility, the driver easily, quickly and safely handles these reels of expensive copper cable. His Model 23 Tulsa Winch does the entire job.

Tulsa* Winch
TULSA, OKLAHOMA
DIVISION OF VICKERS Inc.

*Reg. U. S. Pat. Off.

BOOKS

Received Since Nov. 22

Engineering Cybernetics. By H. S. Tsien. Published by McGraw-Hill Book Co, New York 36, N. Y. 289 pages, illustrated. Price $6.50.

Laplace Transforms for Electrical Engineers. By B. J. Starkey. Published by Iliffe & Sons, Ltd, Dorset House, Stamford Street, London, England. 279 pages, illustrated. Price 30 shillings.

Valves for A. F. Amplifiers. By E. Rodenhuis. Published by Philips' Technical Library, Eindhoven, Holland. 147 pages, illustrated. Price $2.25

Experiments in Electronics and Communication Engineering. By E. H. Schula, L. T. Anderson, R. M. Leger. Published by Harper & Brothers, 49 East 33rd St. New York 16, N. Y. 342 pages, illustrated. Price $6.00

Electronics

Industrial Electronics. By Dr. R. Kretzmann. Published by Philips' Technical Library, Eindhoven, Holland. 236 pages, illustrated.

It presents the general principles of modern industrial electronics and describes the principles and properties of electronic tubes with typical applications and circuits. The mathematics, used only where necessary, is elementary. A separate chapter is devoted to each of the main types of application, such as electronic relays, counting circuits, etc., with practical examples. It is useful to industrial engineers and technicians and college students.

New Mathematical Tables

Chambers's Shorter Six-figure Mathematical Tables. By L. J. Comrie. Published by The Chemical Publishing Co, Inc, 212 5th Ave, New York 10, N. Y. 412 pages. Price $6.50.

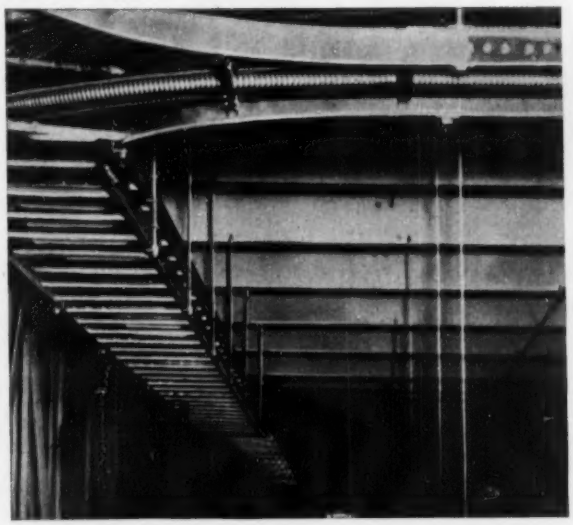
Over a century ago first appeared mathematical tables bearing Chambers's name. Extensions and revisions since have expanded this work to 1,200 pages. Now, for the convenience of workers desiring a more compact set of tables, an abridged form is offered.

This volume opens with a six-place table of common logarithms, followed by trigonometric functions and their logarithms. A 36-page section provides these circular functions based on radians and 71 pages cover adequately the various exponential and hyperbolic functions. Other tables give natural logarithms, inverse circular and hyperbolic functions, powers, roots, reciprocals, factors, factorials, and a variety of other useful data.

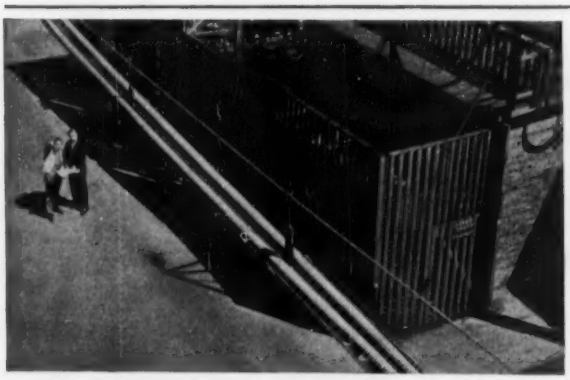
For the engineer requiring accuracy far surpassing the customary slide rule, this collection of mathematical tables will prove valuable. Its author has made particular effort to adjust his tables to the needs of calculating machine operations. Exceptionally clear typography, and a mass of explanatory and interpolative information contribute to its usefulness.

WIRE AND CABLE INFORMATION DIGEST

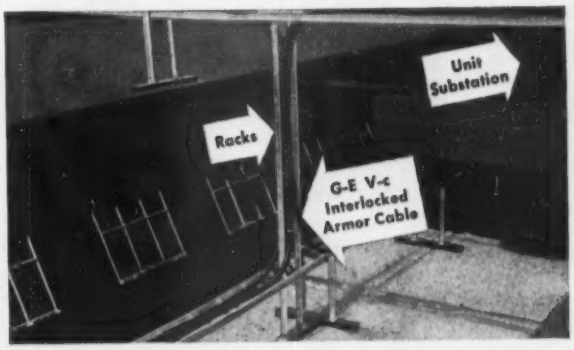
G-E V-c Interlocked Armor Cable cuts feeder installation costs on old or new construction



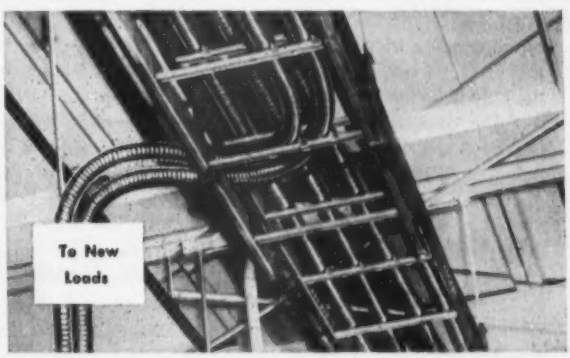
HANG IT FROM THE CEILING—You can install V-c interlocked armor cable in long unbroken runs over beams, around corners, even in unusually cramped areas. Splicing, where needed, is a simple mechanical job. These features often reduce layout and installation time by 50%.



HANG IT BETWEEN BUILDINGS—A G-E V-c interlocked armor cable system weighs only about one third as much as conventional cable and conduit. This means easy handling—indoors or outdoors. Fewer cables, plus simple messenger or rack support further reduce installation time.



RUN IT OVER THE ROOF—Uneven roof contours are no obstacle. Used this way, V-c interlocked armor cable frees working areas without expensive underground duct work or tearing up of concrete floors. It gives extreme economy and flexibility to power distribution.



MEET LOAD CHANGES QUICKLY—EASILY—G-E V-c interlocked armor cable primary or secondary feeder systems can be installed quickly. Each circuit is a separate, flexible cable that needs no conduit. You can easily expand or relocate any circuit to meet changes in load pattern.

PLAN FOR FUTURE EXPANSION IN YOUR CABLE SYSTEM—Write for this helpful booklet on G-E V-c cable, or call the G-E wire and cable specialist in your locality. Section W145-1227, Construction Materials Division, General Electric Company, Bridgeport 2, Conn.

REWIRE AMERICA
WITH GENERAL ELECTRIC WIRING SYSTEMS

Progress Is Our Most Important Product

GENERAL ELECTRIC

READERS FORUM

A Greek Engineer Thanks Americans

[The letter below was sent to Mr. K. S. Field, an engineer in the employ of Ebasco Services, Inc, by Mr. Troumbounis. It appears here for two reasons: 1. The latter requested it to tell the engineering world about the help that is being given to foreign engineers training here. 2. Electrical World believes that American engineers, utilities, and manufacturers should receive public acknowledgement for their great contribution in this field—The Editor.]

The people of Greece have followed for many years the engineering accomplishments of America. They have dreamed of the day when they could establish some of their own projects, such as hydro-electric and steam plants that would benefit all in their little nation. In order to do this, they knew that they had to have the help of the engineering genius of American and other nations to help them.

They also dreamed of the day when their own sons could be trained to exert a major influence in these engineering projects. This dream has become a realty in the form of three hydroelectric stations at 95 Mw and one steam electric station at 80 Mw which were possible because of the financial aid of the American people and the simultaneous technical assistance of the great American republic given by consulting engineers of the Ebasco Services, Inc. Greek engineers have not only been helped in their own country by the Ebasco Services, but they have had the opportunity, as I have now, of coming to the United States to learn the practical and field methods of America. This program is under the sponsorship of the Technical Assistance Program of MSA and being conducted by Ebasco. The program for each trainee is tailored to the position and the individual. This procedure, in combination with the program being employed in Greece and actual work on the various phases of the project, is developing competence in the Greek personnel for taking over the operation of the system.

I believe it is appropriate to express my deep appreciation to you who suggested and took the necessary steps so that the New England Power System, represented by Mr G. A. Palmer, meter engineer of the New England Power Service Co, would take over that part of my training schedule in the USA.

I feel it is my duty to thank Mr G. A. Palmer who has contributed immeasurably with his scientific knowledge and his extraordinary constructional experience to my training program.

I would also like to say that I am deeply indebted to Mr C. E. Matson, meter superintendent of the Public Power Corp in Greece who gave me the opportunity to be trained in the U.S.A.

I also express my gratitude to Mr. J. J. Haman for his constant effort to make possible and easy every step of my program.

I would also like to stress the willingness with which all responsible persons in the New England power companies have helped me in the collection of data and information concerning my training schedule, contributing to it, and thus making it easy, enjoyable, and profitable.

In my estimation, this training is a tremendously rewarding experience.

Telemachos J. Troumbounis

Care of:
J. J. Haman
Ebasco Services, Inc
2 Rector Street
New York 6, N. Y.

Low Rates Only If Load Is Off Peak

To the Editor:

I noted with considerable interest your editorial, "Control of Residential Loads," on page 61 of the Nov. 1 issue.

There is much that is sound and proper in the editorial as written, but I think the writer overlooked a very important detail, which is that competitive considerations have made it necessary in most sections to promote the sale of water heating by a special and considerably below normal rate which has been justified by the off-peak features.

If, as is suggested, it is time to remove the restrictions, then the justification for the special low rate would disappear too, and am sure that in many states companies would be confronted with rate and regulatory commission problems.

C. E. Kohlhepp
President

Wisconsin Public Service Corp
1029 North Marshall Street
Milwaukee 1, Wisconsin

Attrition Type not Ball Type Pulverizers

To The Editor:

In the Oct. 18 issue covering steam station statistics you list the type of pulverizers installed at the various central stations. The list of pulverizers in your tabulation show pulverizers only of the ball type or bowl type.

However, we have furnished our 50 series pulverizers for the Hartford Electric Light plant at their Middletown station as well as for the Dairyland Power Cooperative at Alma and for the Iowa Electric Light & Power Co at Marshalltown, Iowa.

R. J. Krieger
Vice President—Sales

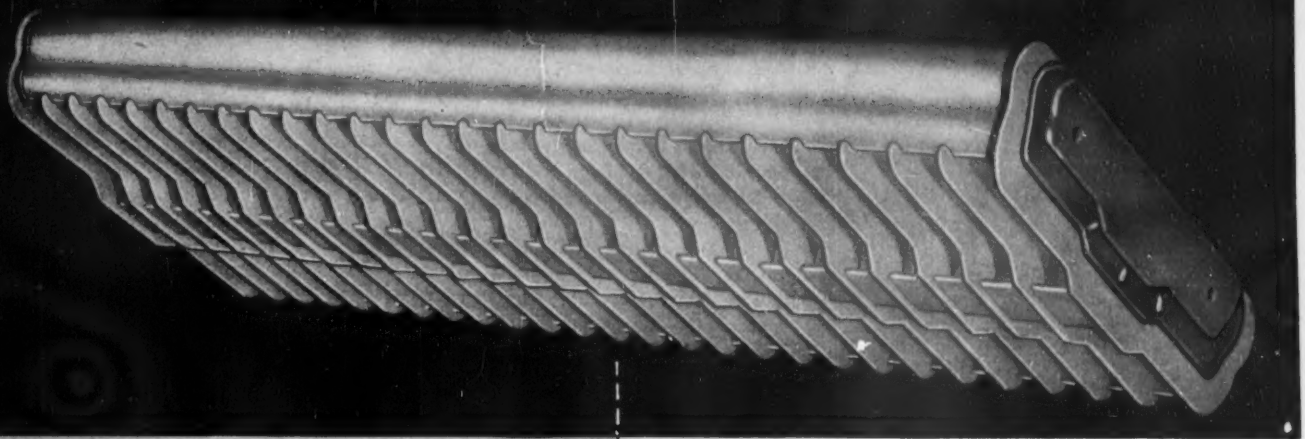
Riley Stoker Corp
Worcester, Mass.

• Riley Stoker Corp's attrition type pulverizer was mistakenly included in our survey listing among the ball type.

Flexibility PLUS

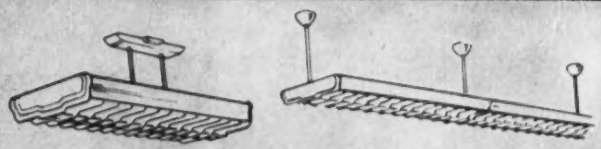
FOR TODAYS MOST EFFICIENT COMMERCIAL LIGHTING

Wheeler FLO-LINER

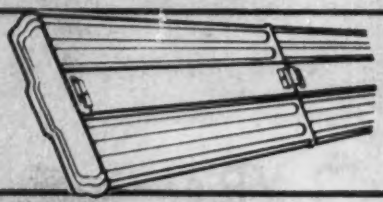


SHIELDING — All fixtures provide 45° crosswise shielding and are available with choice of 25° or 45° lengthwise shielding.

END CAPS — Satin finish aluminum end caps available — order separately.



PENDANT MOUNTING — Stem hanger assemblies are required. Single stem hangers used for continuous row mounting. Twin stem hangers for the mounting of individual 48″ lamp fixtures.



SURFACE MOUNTING — Units may be attached directly to the ceiling. Available as optional equipment are surface mounting plates and top reflectors.

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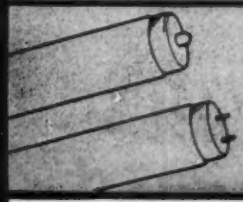
A quality fixture throughout!

85% EFFICIENCY — Translucent plastic side panels and center panel give low brightness for more comfortable seeing and high efficiency. Made of sturdy Polystyrene, they will not warp or discolor. For further seeing comfort 60% of the light is directed above the horizontal.



FIXTURES — 2 lamp and 4 lamp units available for 48 inch 38 watt and 96 inch 74 watt single pin lamps, as well as 48 inch 40 watt bi-pin lamps.

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WP&L Advances Howard

Wisconsin utility elevates executive aide to engineering vice presidency to replace retired Kallevang

J. D. HOWARD

J. D. Howard has been elected vice president in charge of engineering, system operations and maintenance of Wisconsin Power & Light Co. Howard, formerly a vice presidential assistant, succeeds E. J. Kallevang, whose retirement from active service with the utility became effective Dec. 1.

Electrical Engineer . . . Howard, an employee of Wisconsin P&L since 1934, was graduated from the electrical engineering school of Iowa State College in 1925, and then took a three-year student training course with Westinghouse Electric Corp. He was assigned successively to its general works at Pittsburgh, transformer works at Sharon, Pa., and steam turbine and condenser works at Philadelphia. Then he went to the Chicago office of Westinghouse, going later to Davenport, Iowa.

The newly elected vice president joined Wisconsin P&L as an industrial power engineer. He served in various capacities until December, 1941, when he was given a leave of absence to become district manager for the War Production Board. He returned to Wisconsin P&L in 1943 as general sales manager, and in 1953 served for a time as acting district manager in Beloit district.

Returning to headquarters at Madison, Howard was named assistant to the vice president in charge of operations, continuing in that capacity until his recent promotion.

Served as Chief Engineer . . . With his retirement, E. J. Kallevang concluded 44 years of service with the utility industry, 39 years of which were with Wisconsin Power & Light. Kallevang, an electrical engineer, joined Southern Wisconsin Power Co, a predecessor of Wisconsin P&L, in 1915 as line superintendent, becoming chief engineer two years later. He continued with Wisconsin P&L as chief engineer until last July, when he was elected vice president in charge of engineering, system operations, and maintenance.

Born in Decorah, Iowa, Kallevang was graduated from Highland Park College with a B. S. degree in electrical engineering.

•

Robert A. Mycoff, assistant superintendent of West Penn Power Co's Springdale power station, has been named operations engineer at the utility's Pittsburgh headquarters power production staff. Mycoff has been on West Penn's station operation and maintenance staff since 1946.

N. P. Heath, executive vice president of Southwestern Gas & Electric Co, has been named chairman of the executive committee of the board of directors of the company. **S. M. Sharp,** vice president and chief engineer, has been named a member of the board of directors to succeed

(*More Personals on page* 238)

JOHN J. TUOHY

HOWARD B. WAKEMAN

LILCo Appoints 2 VP's

Long Island Lighting Co has elected John J. Tuohy and Howard B. Wakeman as vice presidents. Tuohy, who is now serving as assistant to the president, will be in charge of sales and promotion, advertising and publicity, employee relations, and administrative services. Wakeman, assistant vice president in charge of customer relations, will be in charge of commercial affairs and community relations.

Tuohy joined the utility as an attorney in 1945. He was made assistant to the president in 1950. Since joining the company in 1928, Wakeman has been active in various phases of commercial work. He was appointed assistant vice president in charge of customer relations in 1950.

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Sure we like big orders—and we handle them easily, every day, because our stocks are the world's largest, our cutting and handling facilities unsurpassed. But our business depends on small orders as well, and you'll find we never lose sight of this fact. Whether you want one bar or a thousand—one sheet or many tons, you'll get courteous service—quick delivery. Dependable, certified quality, too. Call us and see.

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Principal products in stock: Bars, structurals, plates, sheets, tubing, alloy steel, stainless, re-bars, etc., also machinery & tools

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PROFIT on selling and installing PLUGMOLD!

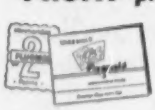
Special New Kitchen Package for contractors. Install this unit in your own home. Merchandise and sell it to your customers. CUTS HOURS OFF ELECTRICAL OUTLET INSTALLATION TIME.

(Free fitting for contractors with one purchase of Plugmold.)

PROFIT on EXTRA business PLUGMOLD will bring you!

Plugmold opens the door to big new market — $15,000,000,000. in electrical modernization needed in 30 million buildings. Sell Plugmold and pull in rewiring business and related sales.

PROFIT *plus* prizes when you PLUG PLUGMOLD!



Contractors and jobbers profit on Plugmold sales and extra business . . . and get valuable prizes, too! Everyone wins — every sale of Plugmold earns prize points.

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See your electrical jobber for details.

The WIREMOLD Company
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News About People

(*Continued from page* 236)

Marshall Walker, who is retiring to become an honorary member. Walker retired from Southwestern Gas & Electric in 1940 after serving for a number of years as a vice president and division manager.

George W. Kessler, who has been assistant chief engineer of the Boiler Division of Babcock & Wilcox Co since April, 1953, has been appointed chief engineer of the division. Kessler joined Babcock & Wilcox as an apprentice engineer in 1930 shortly after graduation from the University of Illinois.

Frank H. Woy, Montana Power Co rate engineer since 1945, has been named an executive assistant and manager of the company's department of rates and depreciation. Woy, an electrical engineer, joined Montana Power in 1945 as a depreciation engineer, later taking over the rate engineering work.

Leslie C. Whitney, manager of development engineering in the Wire and Cable Division of Copperweld Steel Co, has been elected president of the Wire Association.

Ernest Hartford has retired as deputy secretary of the American Society of Mechanical Engineers after 43 years' service to the organization.

Ralph A. Rockwell has been named chief engineer for the Valve Division of Minneapolis-Honeywell Regulator Co. Rockwell, formerly technical consultant to the division, will continue to serve as advisor to the division's sales and engineering departments, co-ordinating design, application, and production of industrial valves.

Assumes New Post

Kenneth B. Gair has been elected vice president and appointed general manager of the Green Fuel Economizer Co, Inc, Beacon, N. Y. The new general manager has been serving as vice president in charge of production and research since March, 1951. Previously he served as production manager, industrial relations di-

(*Continued on page* 240)

40 PAGES of helpful information

on Recovering Dusts, Fly Ash, Mists, Fumes and other Suspensions from Gases.

This booklet summarizes
the important points design and plant engineers should know about Cottrell Precipitators . . .

- Basic types of Cottrell equipment.
- Principal elements in a Cottrell unit.
- Data on Mechanical and Electronic Rectifiers.
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- Typical ways of removing collected material.
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- The effect of various factors on efficiency and performance.
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. . . and many other helpful facts on Cottrell design and operation.

Latest data from Western Precipitation on Cottrell Recovery Equipment

Do you have operations in your plant where gas-laden suspensions, wet or dry, are a problem? Such suspensions may be dropping on surrounding property, causing nuisance difficulties. Or perhaps important values are being lost in stack gases that can be profitably recovered. Whatever the nature of your recovery requirements, you will find this 40-page Cottrell booklet of great help. It contains up-to-date data on the latest advancements in the electrical precipitation field – prepared by the organization that pioneered the commercial application of Cottrell Electrical Precipitators almost a half century ago and has consistently led in new Cottrell developments.

A copy of this data-packed booklet will be sent free to engineers and other executives interested in recovery processes. Send your request to our nearest office.

For nearly 50 years Western Precipitation has carried on a continuous research and development program on Cottrell Electrical Precipitators, Multiclone Mechanical Collectors and other types of recovery equipment. We are not affiliated with any other company in the electrical precipitation field except our wholly owned subsidiaries, International Precipitation Corporation and the Precipitation Company of Canada, Ltd. We are equipped to serve you anywhere in the United States, Canada, and throughout the world!

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News About People

(*Continued from page* 238)

rector and development engineer. Prior to his affiliation with Green Fuel, Gair was a project administrator with Ranger Aircraft Engine Co.

•

Leland B. Bonnett, vice president of Consolidated Edison of New York, Inc, has retired. With the company 31 years, Bonnett started as inside plant engineer in 1923 with the Brooklyn Edison Co, later merged into Consolidated Edison. He was made a vice president in 1940. At the time of his retirement, Bonnett was in charge of design engineering, covering activities in the electrical and mechanical engineering fields. He is a fellow of the American Institute of Electrical Engineers and a member of the American Society of Mechanical Engineers.

Martin F. Bennett has been named director of regional operations for the Radio Corp of America. Bennett, who will supervise operations of RCA's eight regional offices, formerly served as manager of RCA's West Coast region headquartered at Los Angeles.

Chester L. Knight, who has been assistant superintendent of Chestertown Electric Light & Power Co since last May, has assumed the duties of superintendent of the company to replace **Clarence Beilharz,** who retired from the Maryland utility.

Chalmer J. Carothers, Jr, has been named sales manager of special products for the Lighting Division of Sylvania Electric Products, Inc. Carothers, who joined the company in 1948, has been merchandising manager of wiring devices since 1951.

Heads New Division

Revis L. Stephenson, general manager of the Air Appliance Division of U. S. Hoffman Machinery Corp, has been promoted to vice president in charge of the firm's new Industrial Equipment Division, which combines the Air Appliance and Industrial Filtration Divisions. Stephenson joined the Hoffman organization in 1936 as a mechanical engineer. After serving

(*Continued on page* 242)

Remington Rand

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Service Order Cards with space for recording four different occupants or eight orders for service, are filed by address. Each card carries up-to-date "premise" data, enabling completion of order while the customer is still on the phone.

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This record combines in a single reference:

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The Kardex Customer History Record provides speedy, accurate information about all customers while eliminating several separately maintained records.

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News About People

(*Continued from page* 240)

as assistant manager of the Air Appliance Division for about six years, he was elevated to general manager. He is a member of the American Society of Mechanical Engineers. The new organization will take effect Dec. 22, with main offices remaining in New York, while manufacturing will continue in Syracuse, N. Y.

•

Paul A. Van der Meer of the Detroit Edison Co has left for Rio de Janeiro to assist the Brazilian Traction, Light & Power Co in setting up and directing a new public relations program. He has been granted a leave of absence from his duties as Detroit Edison's assistant director of public information in order to accept the new position.

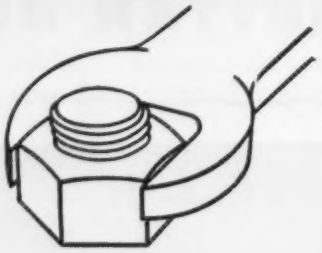
Thomas E. Purcell has retired from Duquesne Light Co after serving nearly 30 years as general superintendent of the power stations department and Allegheny County Steam Heating Co. Purcell, a fellow of the American Society of Mechanical Engineers, has been active in ASME and Edison Electric Institute committee work.

OBITUARY

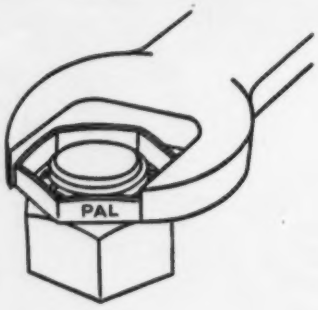
Aubrey E. Beattie, engineering manager for Gulf States Utilities Co, died Nov. 29 at Beaumont, Tex. Beattie had been associated with Gulf States and predecessor firms since 1922. During his career with Gulf States he filled various positions involving construction and transmission and distribution work. In 1942 he went to the utility's system engineering department in Beaumont, advancing to engineering manager in 1950.

Harry B. Sewall, retired Puget Sound Power & Light Co employee, died at Seattle, Wash., Dec. 2. Sewall worked for utilities in the South and Midwest before joining Puget Sound P&L at Bellingham, Wash., in 1917 as division manager. He transferred to Seattle in 1932 as manager of purchases for the company, retiring in 1946 as assistant manager of the Central Division.

Get it tight—



then KEEP it tight



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Paris, Ky., Voters Slated to Settle Franchise Battle

Kentucky Court of Appeals has ruled that the City of Paris must submit to the voters the question of whether a new electric franchise should be offered for sale.

Although Kentucky Utilities Co's franchise officially expired July 1, the company continued to distribute electric power to its Paris customers pending outcome of the lawsuit. A municipal electric system in the city serves more than half of the power customers in Paris, while Kentucky Utilities serves the other city customers and surrounding area.

The municipal power system was set up by the City Board of Commissioners in 1952 after the city refused to renew the Kentucky Utilities franchise. The company sued to put the issue on the ballot at November, 1952, general election and it has been involved in the courts since.

In its new decision the high court reversed Circuit Judge William B. Ardery, who maintained that Paris voters had previously established a policy by voting 2,229 to 180 for the city to acquire its own power system. Since that municipal ownership policy had been established by the people, the lower court held, city officials were not required to call a referendum on the franchise sale.

Kentucky law does not require a city to offer a renewal franchise if the city owns and operates a plant to render the service.

The high court's opinion held, however, that because renewal of the franchise is a legislative and not an administrative matter, Paris should have submitted the question to the voters.

Oregon Fish, Game Units Oppose Co-op Project

Plans of the Coos-Curry Electric Co-operative on the Oregon coast to develop the hydroelectric potential of an Illinois River site have slammed into a serious hurdle.

Oregon's State Game Commission has formally protested to the State Hydroelectric Commission against the co-op's application for a permit. And in the same public hearing at Coquille late last month the State Fish Commission argued the Illinois made a

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per pound of tensile strength per year of service life . . . .

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One large Utility has found that Preformed "Guy-Grips" save 50% on labor and 20% on material. Another assembles and installs a complete Preformed Guy Assembly (4 dead-ends) in the same time it used to take to assemble just one 3-bolt clamp.

PREFORMED "GUY-GRIPS" are proving definitely throughout the Country that they assure:

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That's why Coffing Safety Pull Ratchet-Lever Hoists are standard with so many line maintenance and construction crews. Their record of durability and safety for more than 25 years under actual job conditions puts them in a class by themselves as the wise choice.

Examine the hoists in *your* "laboratory." Which is the oldest one in good working condition? When safety is vital, which hoist does your crew use? We believe the answer is Coffing — the *original* ratchet-lever hoist. If you would like more information on the complete line of Coffing Ratchet-Lever hoists, write for catalog E12SP.

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COFFING HOIST COMPANY
Danville, Illinois

valuable contribution to coast salmon runs and the commercial salmon fisheries off shore. Such opposition has managed to thwart Oregon utility construction plans in the past.

The co-op has asked Federal Power Commission for a preliminary permit to explore a site in Curry County, near Agness, on which it might build a 100 ft high dam to divert water through a 15 ft dia tunnel to a powerhouse which would be located 3.9 miles downstream. Cost is estimated at $28 million and capacity at 140,000 kw with an average output of 43,200 kw. The coastal river flow peaks in winter months when the Northwest's Columbia River, base for the federal system supplying most co-ops and PUD's, is operating on storage.

Need for the project to firm up the growing loads forecast for the Coos-Curry area was outlined by Ivan Laird, Sitkum, co-op president; and David Shaw, Gold Beach attorney and co-op counsel. John S. Cotton, a former FPC engineer, testified for the co-op in favor of the proposal. The U. S. Forest Service, on whose land the site is located, reported no objections to use of the land.

$500-Million Pipeline Looms in B. C. Gas Pact

Construction of $500-million pipeline stretching from San Juan Basin, New Mexico to Peace River looms as result of multi-million dollar agreement to sell British Columbia natural gas to United States expected to be signed soon.

According to sources close to principals of four signature companies, only minor details stand in way of agreement among Westcoast Transmission Co, Pacific Northwest Pipeline Corp, Pacific Gas & Electric Co and El Paso Natural Gas Co.

B. C. section of pipeline, costing $100 million to be built by Westcoast Transmission would extend to California border. Main articles to be ratified in agreement are: 1. Construction of pipeline by Westcoast Transmission from Fort St. John to California, supplying natural gas to entire province of B. C., Seattle, and other cities directly to south with surplus gas going into the California market. 2. Construction by U. S. com-

(*Continued on page* 246)

IT'S NEW! IT'S EXCLUSIVE!

Position indicator drag hands reset from ground . . .

on Westinghouse pole-type regulator

Here at last is the first completely equipped regulator that can be 100% operated from the ground. It is the Westinghouse URL-16 pole-mounted, step-voltage regulator—now furnished with a new position indicator.

An exclusive new pushbutton reset is located at the bottom of the indicator and is cup-shaped to take a hookstick. It is spring loaded for fast, easy resetting of the drag hands from the ground. Drag hands show at a glance the maximum steps the regulator has operated to raise and to lower voltage since the last reading. The indicator is inclined 25° for high readability from the ground. Hands are big and in contrasting colors. The dial size and numerals are extra large for quick, accurate readings. Dials bear standard NEMA markings.

Now it is practical to make more frequent load checks for less money. Since no pole climbing is necessary, only one man is needed. Operating procedure is streamlined at a saving in dollars.

Booklet B-6053 contains complete information on the full line of Westinghouse voltage regulators. If you don't already have your copy, contact your Westinghouse representative or write: Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

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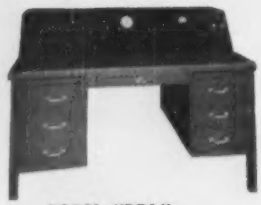

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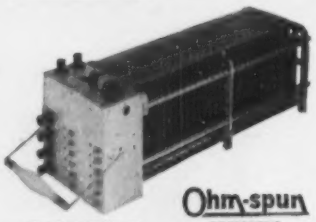

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Natural Gas Pipeline

(*Continued from page* 244)

panies of line from San Juan Basin to meet B. C. line at California border. 3. Line from California border into eastern Washington and Oregon. B. C. expected to sell 500 million-cu ft gas per day under agreement. This broken down into 100 million for B. C., 100 million for Washington, 100 million for Oregon and 200 million for California.

Officials who have studied the growing market for gas along the Pacific Coast estimate that within six years this will reach 750 million cu ft a day from B. C. wells.

When agreement is signed it must go before Federal Power Commission in Washington for certification. This is expected to take about one month.

Start of line planned for early next year and will take two years to complete.

Quebec Hydro Cable Trial Fails; New Test Planned

Rene Dupuis, Quebec Hydro-Electric Commissioner, has revealed that trial transmission of electric power through four underwater cables laid across the St. Lawrence River between Pointe Manicouagan and Les Boules "was not carried out successfully" and "necessary adjustments have had to be made." Another transmission trial is scheduled for this year by the commission.

The 34½-mile long cable—described by Hydro engineers as unique—was laid last August by a United Kingdom postal department vessel. Official inauguration took place last October at Les Boules, on the river's south shore 236 miles east of Quebec City.

From Les Boules the power is to be transmitted through 142 miles of overland lines to reach a Gaspe interior copper mining site.

El Segundo Expansion

Southern California Edison Co will add a second 156,000-kw unit to its tidewater steam plant now under construction in El Segundo, Calif. This unit is scheduled to be ready for operation in September, 1956.

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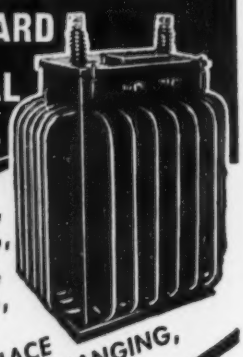

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PEA T&D Group . . .

. . . touches on management, engineering, and operations at meeting at Hagerstown, Md.

Management, operation, and engineering shared the program of Pennsylvania Electric Association's Transmission and Distribution Committee meeting at Hagerstown, Md., last month (Nov 4-5).

Management must approach customer relations with as much philosophy as it does accident prevention, declared Vice-Pres S. S. Bradford, Potomac Edison Co. Utility service cannot give freedom to choose where to buy and where to work, so utilities must learn to win public favor, he continued.

More customer relations appeared in the plea of H. H. Startzman, another Potomac Edison vice president, for electric service continuity and voltage to meet the demands of modern appliances. But management looks to transmission and distribution for future savings, he warned, because investment in them exceeds that for generation.

Secondary Capacitor Symposium . . . Secondary capacitors are valuable in emergency to relieve overloaded transformers and correct low voltage, said Hamilton Brooks, Westinghouse Electric. But general application can seldom be justified economically unless primary capacitors also could be justified. When secondary capacitors are used extensively, he said, fixed primary capacitors should be removed or converted to switched operation.

Gains in system load capability are the most frequent justification for secondary capacitors, Brooks continued. Reduction of losses is never the predominating benefit and the value of voltage improvement is subject to great variations. Operating experience has been almost trouble-free, but a fuse is desirable in one lead to guard against case rupture. Grounding the tank requires fuses in both leads.

Overall cost governs use of secondary capacitors for reactive supply, commented Chase Hutchinson, Ebasco Services, Inc. Where kva capability is costly, as in underground distribution, they are an economic bonanza but may need forced-air cooling.

(*Continued on page* 249)

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PEA T&D Group

(*Continued from page* 247)

Hutchinson indicated that overhead installations are best made in conjunction with transformer work, following a set application policy. Failures in service run as low as 0.22 per 1,000 capacitor years after an initial "shake down period," he added. But failures can resemble trench mortar fire unless units are properly fused.

A short-cut method for determining whether capacitors should be primary or secondary was presented by N. M. Neagle, General Electric. Advantages of secondary capacitors are reduction of distribution transformer and secondary losses and additional voltage boost. He implied that the general case justifies capacitors at both system levels, but that wise proportioning gives the best economic return.

Connection of secondary-type capacitors in series with the transformer primary neutral was disclosed in discussion. One participant reported that a western utility has 200 such installations and is exploring the economics of general use on 2.4-kv transformers. Over-current protection is by 600-v lightning arresters.

Transformer Failures Surveyed . . . Distribution transformer failures now show a more consistent pattern. Data collected from 11 cooperating utilities by C. E. Hartay, Duquesne Light, covered 242,542 units for 1953, a 35% increase over the previous year's report. Self-protected units experienced 0.38 failures per 100 against 0.87 for conventional. A large factor in this difference was virtual absence of self-protected failures from secondary faults and overloads.

Nine Pennsylvania utilities have 2,636 oil reclosers, reported W. T. Donovan, Pennsylvania Power. The new total reflects 21.5% growth in one year. These reclosers averaged 6.8 operations each during the year with only 1.4 faulty operations per 100 reclosers. Lack of lightning arresters on 1,195 units did not reflect in lightning damage, he noted.

Donovan's report also covered reclosing fused cutouts, of which 674 are in service on 7 systems. Growth for these was 44% in one year. They averaged 0.34 operations in 1953 with 2.5 faulty operations per 100 units.

Completion of Pennsylvania Electric

(*Continued on page* 251)

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PEA T&D Group

(*Continued from page* 249)

Co's bundling project was announced by P. L. Lumnitzer. Project involved 25.5 mi of 115-kv on wood H-frames. New 226,800-cm ACSR was prestretched to match severe ice loading which had stretched existing conductors, then slacked off to match existing sags. Bundle spacing of 13 in. is maintained by conventional strain yokes at insulator strings and wire spacers up to 200 ft apart in spans. Cost was less than re-conductoring and far below building a new line, he said.

Additional information about the line was given by T. F. Peterson, Preformed Line Products. Eliminating clamping pressure can reduce vibration failures, he claimed, but the damping effect of armor rods cannot match Stockbridge dampers.

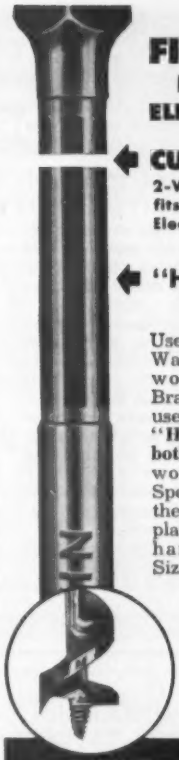
Where shape permits its use, said F. W. Boyd, Kimble Glass, tempered glass makes insulators with better dielectric qualities and more resistance to mechanical damage. He demonstrated their high resistance to impact and complete disintegration when failure occurs. A new coating technique will improve RI and TVI characteristics, he said. And future developments will provide larger pin-type insulators and possibly suspension units.

Closing session of the two-day program was allotted to switch manufacturers for presentation of recent developments. Scheduled speakers were J. B. Owens, R & I E Division of I T E Circuit Breaker Co, and L. R. Crane, A. B. Chance Co.

Neuberger Asks Power for Harvey Aluminum Mill

U. S. Senator-Elect Richard L. Neuberger, Democrat and critic of the Eisenhower Administration's federal power policies, has asked Interior Secretary Douglas McKay to make 1956 budgetary provision for Bonneville Power Administration to supply power to the aluminum reduction mill Harvey Machine Co has been authorized to build at The Dalles.

Neuberger said he understands BPA has contracted with Harvey to supply 40,000 kw of firm power, 20,000 kw of "first interruptible" and 60,000 kw of "ordinary interruptible."



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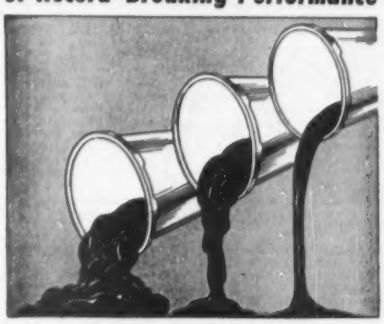

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Replies (in complete confidence) should include full history and recent snapshot if available.

If you are doubtful reply blind with general record to Classified Advertising Div., Electrical World, who will apply a blind key number to your application and arranged to forward further correspondence to you.

P-4766, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

MANUFACTURER'S REPRESENTATIVE

For States in New England. Well established manufacturer selling to the electric utility industry. Your reply will be held confidential. Give full particulars on territory covered and items now handled. Address all replies to

RW-4507, Electrical World
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

DISTRIBUTION ENGINEERS—Graduate electrical engineers — Senior approximately 10 years field experience with operating utility company. Junior at least 2 years experience. Permanent position long established consulting organization New York. Some travel Latin America necessary in future. Knowledge of Spanish or Portuguese useful. Salary commensurate with experience. Reply stating age, education, experience, personal particulars and minimum salary expected. P-4849, Electrical World.

DISTRIBUTION ENGINEERS — Competent graduate electrical engineers with approximately 10 years experience design, operation and maintenance of distribution facilities required by rapidly growing utility desirable location South America. Portuguese or Spanish useful—not required to start. Reply stating age, education, experience, personal particulars and minimum salary expected. P-4850, Electrical World.

EMPLOYMENT SERVICE

SALARIED PERSONNEL, $3,000-$25,000. This confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

ELECTRICAL ENGINEER, BEE, PE, 40, seeks work with supervisory responsibility in research, design, and application of control equipment and electrical apparatus. Have experience in this type of work in the steel and rubber industries, and in field of liquid metals for heat transfer. PW-4836, Electrical World.

ELECTRICAL STAFF Engineer & Draftsman over 10 years industrial experience in power wiring, lighting layouts, automatic control wiring, estimating and supervision of electrical installations. Married, age 33 desires responsible position with future. PW-4741, Electrical World.

WANTED

MANUFACTURER'S AGENT

For Direct Sales to Electric Utilities established line of electric meter testing and installation accessories and equipment — Territories — Montana, Nevada, North Dakota, South Dakota and Wyoming. Well known manufacturer selling Utilities for over 30 years.

Advise full particulars—lines now carried and territory covered. Replies held confidential.

RW-4505, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS WANTED

REGISTERED ELECTRICAL Engineer—State of California—specialist on rotating electrical machines & controls—industrial & marine—45 years varied experience. Excellent health & references. Wishes to represent electrical manufacturer as technical sales engineer. Write Box L—1544 Spruce Street Berkeley 9, California. AH 3-10105.

RETIRED INDUSTRIAL Electrical Engineer wishes a few years of electrical Power design, salary or fee basis. PW-4760, Electrical World.

PERIODICALS

A.I.E.E. transactions back-volumes wanted to buy for cash, Ashley 24 E. 21, N.Y.C. (10).

OFFICIAL PROPOSALS

Bids: January 6, 1954

The Furnishing and Delivery of 60,000 KVA Alternating Current Generators

POWER AUTHORITY OF THE STATE OF NEW YORK
ST. LAWRENCE POWER PROJECT
FOR
SPECIFICATIONS NO. PA-4-14001
ST. LAWRENCE CONTRACT NO. P3

NOTICE TO CONTRACTORS: The POWER AUTHORITY OF THE STATE OF NEW YORK will receive sealed proposals for the design, manufacture, and furnishing of 60,000 KVA alternating current generators and delivery thereof f.o.b. Massena, New York, until 10:30 A.M. Eastern Standard Time on the 6th day of January, 1955 at the Authority's office, 270 Broadway, Room 1207A, New York 7, New York, at which time and place proposals will be publicly opened and read aloud.

Bids will be entertained for 4, 8, 12 or 16 generators and associated equipment and services in accordance with the bidding schedules. Erection at the site of installaton will be done by others but services of erection engineers shall be provided by the manufacturer if and when required.

Bids will not be restricted to American manufacturers.

Plans, specifications and proposal forms for the work are on file in the Authority's Office and in the offices of the Engineer, Uhl, Hall & Rich, 230 Congress Street, Boston 10, Massachusetts, and the Hydro-Electric Power Commission of Ontario, 620 University Avenue, Toronto 2, Ontario, and may be inspected by prospective bidders during office hours.

Plans, specifications and proposal forms may be obtained from the Power Authority of the State of New York, 270 Broadway, Room 1300, New York 7, New York, after November 19, 1954 upon application and prepayment of a fee of Twenty-five ($25.00) dollars per set of two bound copies of Contract Documents, no part of which will be refunded.

Bids must be made in duplicate upon the proposal forms included in and bound with the Contract Documents. Guarantee will be required with each bid in an amount not less than 10 percent of the maximum price bid for any bid schedule.

The right is reserved to reject any or all bids.

W. S. CHAPIN
GENERAL MANAGER

OFFICIAL PROPOSALS

Bids: January 5, 1954

The Furnishing and Delivery of 71,000 HP Hydraulic Turbines

POWER AUTHORITY OF THE STATE OF NEW YORK
ST. LAWRENCE POWER PROJECT
FOR
SPECIFICATIONS NO. PA-4-15001
ST. LAWRENC CONTRACT NO. P2

NOTICE TO CONTRACTORS: The POWER AUTHORITY OF THE STATE OF NEW YORK will receive sealed proposals for the design, manufacture, and furnishing of 71,000 HP hydraulic turbines and delivery thereof f.o.b. Massena, New York, until 10:30 A.M. Eastern Standard Time on the 5th day of January, 1955 at the Authority's office, 270 Broadway, Room 1207A, New York 7, New York, at which time and place proposals will be publicly opened and read aloud.

Bids will be entertained for 4, 8, 12 or 16 turbines and associated equipment and services in accordance with the bidding schedules. Erection at the site of installation will be done by others but services of erection engineers and mechanics shall be provided by the manufacturer if and when required.

Bids will not be restricted to American manufacturers.

Plans, specifications and Proposal Forms for the work are on file in the Authority's Office and in the offices of the Engineer, Uhl, Hall & Rich, 230 Congress Street, Boston 10, Massachusetts, and the Hydro-Electric Power Commission of Ontario, 620 University Avenue, Toronto 2, Ontario, and may be inspected by prospective bidders during office hours.

Plans, specifications and Proposal Forms may be obtained from the Power Authority of the State of New York, 270 Broadway, Room 1300, New York 7, New York, after November 15, 1954 upon application and prepayment of a fee of Fifteen ($15.00) dollars per set of two bound copies of Contract Documents, no part of which will be refunded.

Bids must be made in duplicate upon the proposal forms included in and bound with the Contract Documents. Guarantee will be required with each bid in an amount not less than 10 percent of the maximum price bid for any bid schedule.

The right is reserved to reject any or all bids.

W. S. CHAPIN
GENERAL MANAGER

U. S. Government

Sealed bids for furnishing labor, equipment, materials and performing all work required for site preparation, construction of substation, installation of all equipment and accessories, other related work, will be received in the office of the Engineering and Construction Director, Balboa Heights, Canal Zone, until 10:05 A.M. January 3, 1955, and at that time publicly opened. Plans and specifications are available at the office of the Procurement Officer, Panama Canal Company, 21 West Street, New York 6, N. Y. Deposit of $40.00 required.

WANTED

DIESEL ELECTRIC UNITS

Needed Used Diesel Electric Units from 2500 K.W. to 5000 K.W. Sea level rating to generate at 2400/4160 volts three phase-60 cycles, history, prices, place & term of Delivery.

Post Office Box 1324
New York 8, New York

WORLD'S LARGEST INVENTORY

FREE CATALOG

MOTORS-GENERATORS-TRANSFORMERS
New and Guaranteed Rebuilt
1 H.P. to 2500 H.P.
ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

TRANSFORMERS

FOR SALE

3—1000 KVA Mol. 13200-2400/4160Y
3—1000 KVA Mol. 11500-2400/4160Y
3— 833 KVA G-E 35000—480
3— 500 KVA G-E 26400—240/480
5— 333 KVA W-H 38000-7200/12470Y
3— 333 KVA G-E 33000-2300/4000Y/6900/-11950Y
3— 333 KVA G-E 33000-2300/4000Y
3— 333 KVA Mol 7200/12470Y-2500/4160Y
9— 200 KVA W-H 13200-230/460
3— 150 KVA G-E 19050/33000Y-2540/4000Y
5— 150 KVA G-E 7200/12470Y-240/480
3— 100 KVA G-E 33000-6900/11950Y

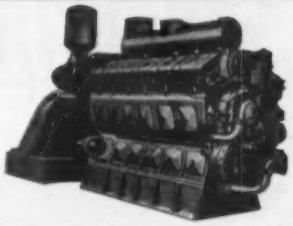
Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
Cincinnati 27, Ohio
40 Years Dependable Service

DIESEL POWER



IMMEDIATE SHIPMENT
• PURCHASE OR RENTAL
UNIT CAPACITIES—10 TO 2475 KVA
A.C.—50 AND 60 CYCLES
• ALSO D.C. UNITS

A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1180	Worthington	SEH-8	1685	360	320	Superior	60E-6	460	450
1136	Fairbanks Morse	38D	1600	720	300	General Motors	8-268A	450	1200
1100	General Motors	16-278A	1600	720	250	Clark	GD-4	373	360
750	General Motors	12-567	1080	720	200	General Motors	6-268A	350	900
700	Worthington	EE-8	1000	327	175	General Motors	12-71	275	1800
600	General Motors	12-567	860	600	150	Worthington	CC-4	225	450
500	General Motors	8-567	720	720	150	Buckeye	80	240	600
500	Alco	6-12½x13T	750	600	148	Fairbanks Morse	32E14	220	300
350	Baldwin	VO-6	510	450	100	General Motors	3-268A	150	1200
320	Enterprise	DSG-6	460	450	60	General Motors	6-71	90	1200

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 63rd ST., NORTH BERGEN, N. J. N. Y. C. Tel. LOngacre 5-3227 N. J. Tel. UNion 4-2600

TRANSFORMERS 60 CYCLE

2—3750 KVA G.E.—3 ph. (new) type OA outdoor 26,400 V., pri. 4380 V. sec.
1—1000 KVA, Amer., 3 ph., 4150/480 V. Asbestol.
1— 750 KVA G.E. type HT, 3/60, 4150-230V.
2— 750 KVA, G.E., type H, 1 Ph., 4150-230V.
3— 100 KVA, Wagner, 1 Ph., 460-115/230V.
3— 50 KVA G.E., Type H, 460, X115/230.
3— 50 KVA Whse. New. OISC, 2400/4160Y. X240/480.
3—37½—KVA G.E., Type H, 2400/4160, X 120/240.

SYNCHRONOUS MOTORS

1— 500 HP., Whse. type HR, 450 RPM, 2300V.
1— 150 H.P., G.E., 1800 RPM. 220V. 3/60.
2— 150 H.P., Al. Chal 360 RPM. 440V. 3/60.

MOTOR GENERATOR SETS

1—1000 KW Whse., 600 V. 720 RPM, 4150 syn.
1—1000 KW G.E., 600 V. 514 RPM 4000 Syn.
1— 750 KW Whse., 275 V. 720 RPM. 4000 Syn.
1— 300 G.E. 250 V. 1200 rpm. S.R.
1— 200 KW Whse., 250 V. 900 RPM. 4000V. Syn.
1— 150 KW G.E., 125/250V. 1200 RPM 2300 Syn.

SLIP RING MOTORS

2— 500 H.P., G.E., M 1200 RPM 2400V.
1— 400 H.P., West., CW, 450 RPM. 550V.
1— 250 H.P. West., CW, 600 RPM. 440V.
1— 200 H.P., West., CW, 600 RPM. 440V.
3— 150 HP., Al. Ch. 1800 RPM. 2300V., APH. 60 Cy.

Large Stock of A.C. and D.C. Equipment

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

SUBSTATIONS EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
1	10000	A.C.	66000—33000, 3 ph.
1	3750	West.	69000—14400, 3 ph.
4	2500	Mol.	66000—13800
3	800	Kuhl.	66000—480
3	667	Kuhl.	66000—480
4	500	West.	69000—6900
3	400	G. E.	66000/33000—2300/4160
3	333	Stand.	69000/34500—7200/12470 Y
3	200	Pitts.	66000—2300
3	1500	Wag.	44000—6900
3	1250	A. C.	44000/11500—460
4	150	West.	44000/33000—2300/6900
3	75	West.	44000—7200/12470 Y
3	5000	G. E.	38100/66000—6600
1	3750	Penna.	38030/65865 Y—13800, 3 ph.
4	3333	G. E.	38100/66000 Y—3300
4	3125	Mol.	39900/66000 Y—26600/46000 Y
6	2000	Mol.	38100/66000 Y—13800
3	3333	G. E.	33000/11000—2400/7200
4	333	G. E.	34500—13800/23900 Y
3	200	A. C.	34500—2400/7200/12470 Y
3	75	Wag.	33000—240/480
3	1250	G. E.	26400/13200—2400
4	1500	A. C.	25400/44000 Y—6900/13800
4	450	A. C.	25410/44000 Y—13280/23000
3	100	G. E.	22900—7200/12470 Y
1	2000	G. E.	13800—2300, 3 ph.
3	667	G. E.	13800—2300
1	600	Stand.	13200—2300, 3 ph.
1	450	Penna.	13200—2400, 3 ph. ASKAREL
6	200	G. E.	13200—230/460
4	167	G. E.	7200/12470 Y—2400
3	125	A. C.	6900—2300
3	37½	G. E.	6900—230/460
4	150	G. E.	4800/2400—240/120
2	100	G. E.	4800/2400—240/480
1	1500	G. E.	4160—480, 3 ph.
3	333	G. E.	2400/4160 Y—460
3	250	G. E.	2300/4000 Y—115/230
3	200	West.	2400—240/480
3	150	West.	2400—230/115
1	100	G. E.	2300—575, 3 ph.
6	50	West.	2400—114/228 DRY TYPE
1	50	G. E.	2400/4160 Y—240/460, 3 ph.

ALSO:—FREQUENCY CHANGERS
MOTOR GENERATOR SETS
SYNCH. CONDENSERS
OIL CIRCUIT BREAKERS
FEEDER REGULATORS, etc.

BREW, WOLTMAN & CO., INC.
52 Church St. New York 7, New York

RE-NU-BUILT
GUARANTEED

ELECTRIC POWER EQUIPMENT

MOTOR GENERATOR SETS

3 ph., 60 cy.

Qu.	KW	Make	Speed	DC Volts	DC Volts
1	3000 AU	G.E.	514	600	4000/12200
2	2000/2400	G.E.	450	250/300	2300/4600
2	2000	G.E.	514	600	6600/13200
1	2000	G.E.	500	666 25 cy.	11000
2	2000	G.E.	450	600	2300/4600
1	1500	C.W.	514	115	4000/13800
1	1500	G.E.	720	600	12200
1	1000	G.E.	900	260	4100/6900
3	1000	G.E.	720	600	2300/4600
2	750	G.E.	720	275	2300/4600
1	500	Whse.	1200	125/250	2300
1	500	Whse.	900	250	440
1	500	G.E.	720	125	2300

TURBO GENERATORS

Qu.	KW	Make	Desc.
1	4000	G.E	Condensing—425 lbs—750° F.T.T.—Surface Condenser 3/60/2300-4000 v with exciter
1	1000	G.E.	Non-Cond—190 lbs-2400-3-60
1	1000	Moore	Condensing — Extraction—190 lbs., 2400-3-60—Surface Cond
1	750	G.E.	Condensing—265 lbs., 440-3-60 Built 1944
1	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480-3-60 Dir. Conn. Exciter.
1	300	G.E.	Non-Cond—150/175 lbs., 5/10 lbs. B. P. 480-3-60

FREQUENCY CHANGERS

Qu.	Kva	Make	Cycles	Voltages
1	3000	Whse.	60/25	13200 x 13200
1	3750	G.E.	60/25	4150/2400 x 2400/4150
1	3125	G.E.	25/60	4150/2400 x 2480/4150
2	2500	G.E.	25/62½	2300 x 4160
1	1250	G.E.	25/58.3	4400 x 2300
1	625	A.C.	25/60	11000 x 2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1	5000	Whse.	OISC	3	33000x26400/13200
1	2500	Whse.	OISC	3	26400/13200 x 480
3	2000	G.E.	HVDDJ	1	66000 x 13800
3	667	G.E.	HD	1	13800 x 2300
3	1250	G.E.	HVDDJ		6600/450
3	1000	G.E.	HVDDJ	1	2200/480

BELYEA COMPANY, INC.
51 Howell Street, Jersey City 6, N. Y.

ELECTRICAL WIRE AND CABLE

—Your Best Source—
- for every industrial and power application
- Odd lengths—long and short—reasonably priced
- **LARGEST STOCK IN MIDWEST**

Let us quote on requirements—send your inquiries
We'll also buy your Surplus

Branch Offices:
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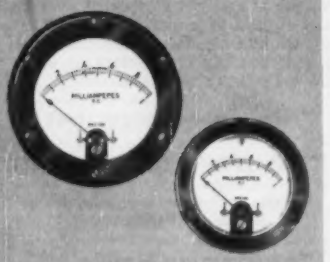
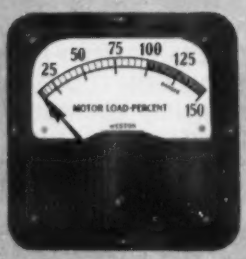
UNIVERSAL Wire and Cable Co.
2662 N. Clybern Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

designer's INSTRUMENT guide

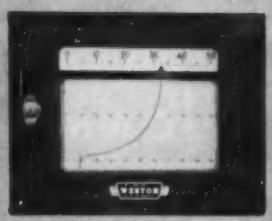


RUGGEDIZED INSTRUMENTS —to military specifications, available in 2½", 3½" and 4½" sizes in D-C, movable iron A-C, rectifier type A-C and thermo instruments. All have sealed, externally operated zero correctors—shock-resisting, flat plastic windows—and connection terminals molded into internal rubber.

ULTRA-SENSITIVE RELAYS —extremely compact and rugged relays which operate on values as low as ⅓ microampere or ¼ millivolt, direct from thermocouples, resistance bulbs or other generators of minute current. Handle substantial wattage at 110 volts on non-chattering magnetic contacts. Available with single or double contacts, fixed or adjustable, manual or solenoid reset.



"MOTOR LOAD %" METERS —WESTON "per-cent load" ammeters and wattmeters make it easy for operators to secure optimum production from lathes, milling machines, automatics, grinders, etc. Prevent overloading—reduce tool breakage—assure uniform quality with fewer objects. Other scale calibrations available.



RECORDING POTENTIOMETER —ideal for built-in needs because of its extreme compactness plus ruggedness and simplicity. Ranges changed simply by inserting required range standards. Chart speeds changed by simple screwdriver adjustment. Plug-in amplifier removed in a jiffy since no soldered connections are used.

Literature on any of the above instruments sent on request.
WESTON Electrical Instrument Corporation,
614 Frelinghuysen Avenue, Newark 5, New Jersey.

8106

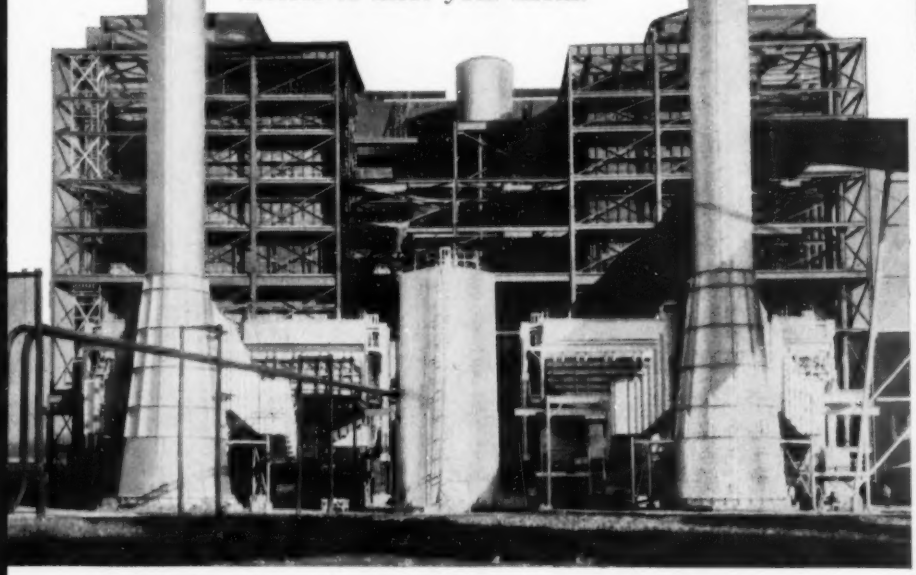
WESTON *Instruments*

What are they using at Meramec?

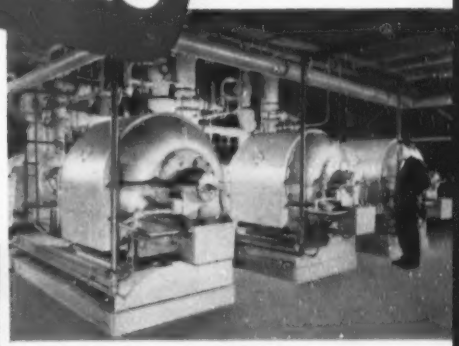
Another utility chooses Allis-Chalmers motors for reliability and economy. At Union Electric Company's new Meramec plant, all motors for all auxiliaries were furnished by Allis-Chalmers.

Allis-Chalmers builds a complete line of integral horsepower motors for power plant service. Your A-C representative will be glad to help you select the best motors to meet your needs.

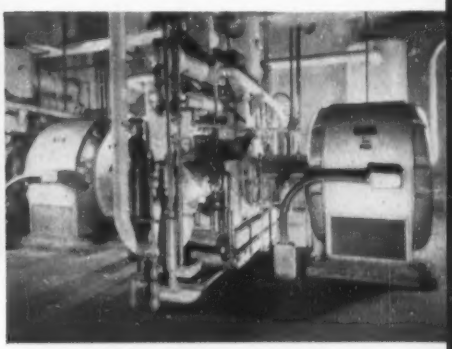
ALLIS-CHALMERS Auxiliary-Drive MOTORS



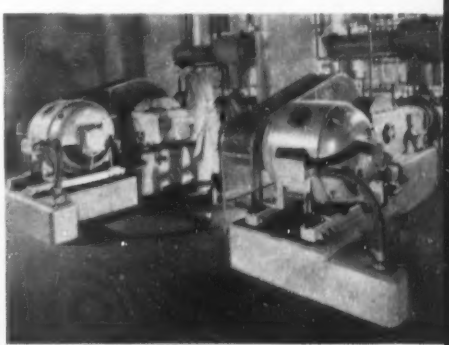
Built in the modern semi-outdoor style, Union Electric Company's Meramec station has two units with a total installed capacity of 250,000 kw.



Three of six 1500-hp, 3580-rpm, 4000-volt Allis-Chalmers two-pole motors driving boiler feed pumps.



Two of three 300-hp, 353-rpm, 4000-volt Allis-Chalmers squirrel-cage motors driving soot blower air compressors.



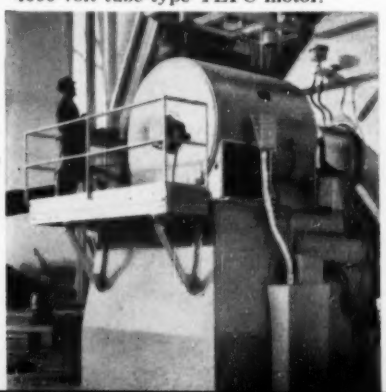
These compressors provide air for service lines . . . are driven by Allis-Chalmers 100-hp, 1170-rpm, 440-volt cage motors.

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

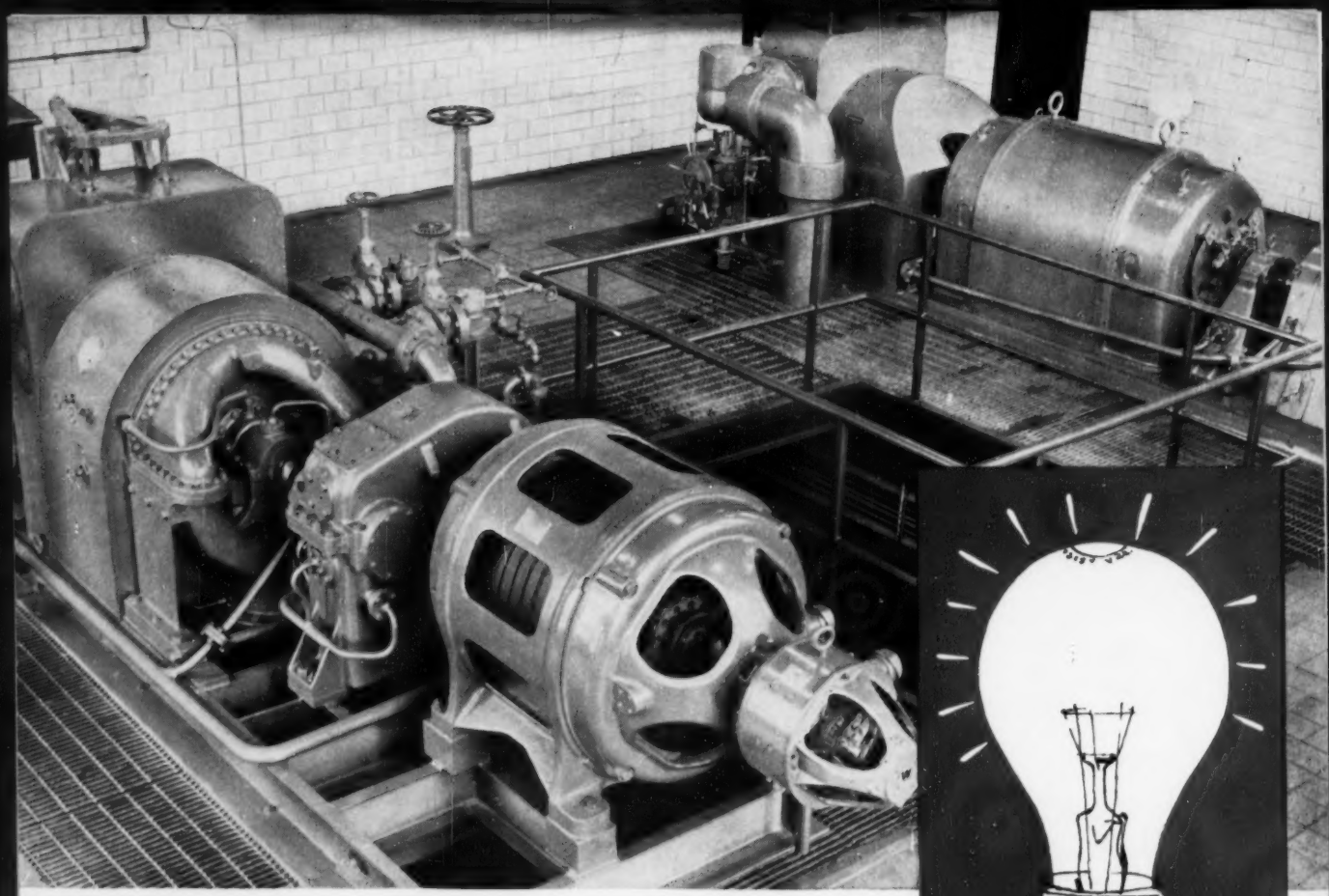
A-C ALLIS-CHALMERS

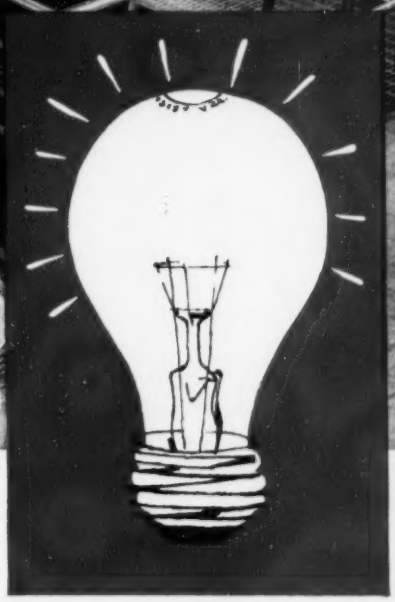
Each induced draft fan is powered by an Allis-Chalmers 1000-hp, 710-rpm, 4000-volt tube-type TEFC motor.



Four of these 500-hp, 425-rpm, 4000-volt vertical pipe-ventilated motors drive condenser circulating pumps.

A-4526





13 years of light and power minus <u>any</u> sludge or deposits with . . .

Oil troubles followed installation of a turbine at a large midwest institution. Water couldn't be separated out of the oil. Acidity was high. Sludge and deposits were heavy. Filters had to be cleaned frequently and, eventually the whole system had to be cleaned.

Like other operators in trouble, the institution asked the advice of a Standard Oil lubrication specialist. He recommended a specific grade of NONPAREIL Turbine Oil, a highly stable, additive-type oil with a distinguished record for clean-system operation.

NONPAREIL completely eliminated the troubles. For 13 years there has been no need for shutting down the turbine to clean the oil system. Centrifuging has been the only method of treating the oil. Acidity has always remained low—never over 0.09 mg. KOH/gm. When a new and larger (750 KW) unit was installed in 1947, outstanding past performance had sold NONPAREIL into another job.

The Standard Oil lubrication specialist near you will be glad to show you lubrication records of NONPAREIL in installations similar to yours. In the Midwest, phone your local Standard Oil office. Or write: Standard Oil Company, 910 S. Michigan Avenue, Chicago 80, Illinois.

NONPAREIL
TRADE MARK
Turbine Oil

Trouble-free operation is assured *for the life of all turbines* lubricated with NONPAREIL. With each fill goes a written guarantee that it will last as long as the turbine, and that the neutralization number will never exceed 0.15 mg. KOH/gm. Where can you beat such a promise of product performance?

STANDARD OIL COMPANY
(Indiana)

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